

JOURNAL
OF THE
BOMBAY
Natural History Society

No. 3.] BOMBAY, JULY, 1888. [Vol. III.

UNSCIENTIFIC NOTES ON THE TIGER.

By J. D. INVERARITY.

(*Read at the Society's Meeting on 9th April 1888.*)

THE title of this paper will have given you notice that I do not make any pretensions to the learned and scientific attainments of the gentlemen who have instructed and amused us by the able papers hitherto read at our monthly meetings. One of the chief pleasures of shikaring, to my mind, is the observation of the manners and customs of the animals one pursues. I keep a journal when in the jungle, so I have been able to correct my memory by reference to notes made at the time. When I was looking up materials for this paper, I was surprised to find how many small but valuable details I should have forgotten without the aid of my journal. I meant to have astonished you with some exceptionally large tigers, but as my notes show them to have been considerably smaller than I should have imagined, if trusting to memory alone, I am unable to do so. In fact, I find that I have never killed or seen killed a tiger that measured so much as 10 feet. The size of tigers gives rise from time to time to animated discussions in sporting books and in sporting newspapers, some maintaining that tigers of 11, 12 or even 14 feet have been slain, others fixing about $10\frac{1}{2}$ feet as the limit. The accepted mode of measurement is to run the tape from

the tip of the nose to the end of the tail, as the tiger lies on his side on the ground, following the curves of the body. If this method is fairly adopted, a tiger in Western India or the Central Provinces of over 10 feet will be found to be very uncommon. A large number of adult tigers will be found to be under 9 feet, and I think myself that the majority of tigers are under 9 feet 6 inches. The largest tigress, in my own experience, measured 9 feet 1 inch : they usually measure about $8\frac{1}{2}$ feet. There very probably is an occasional Chang among tigers of abnormal size, which may account for some of the exceptional measurements one reads about. If however, one measures out 12 feet on the wall of a room and sketches in a tiger in the space measured out one realizes that a 12-foot tiger would astonish one. Colonel Peyton, who had a very long experience in the Canara forests, mentions in his very interesting article on Tigers in Vol. 15 of the *Bombay Gazetteer* only five being shot in Canara over 10 feet, the largest being 10 feet $2\frac{1}{2}$ inches. Mr. Mulock, of the Bombay Civil Service, who has been at the death of as many tigers as any one on this side of India, tells me that to the best of his recollection he has only seen one or two over 10 feet. Mr. Sanderson in his book gives 9 feet 6 inches as the largest he killed. Captain Forsyth mentions, I think, only two over 10 feet. The usual mode of arriving at the size of tigers, though convenient, and giving one a fair general idea is sometimes deceptive, owing to the tail (which is included in the measurement), varying in length in different animals, so that a stontly built tiger with a short tail does not have justice done to him. The skull tells you at once whether the tiger was a large or small one. Mr. Sterndale, in his " Mammals of India," has elaborate calculations, showing from the measurement of the skull what length the tiger who owned the skull ought to have been. I have here the skulls of three tigresses which measured 8 feet 9 inches, 8 feet 6 inches, and 8 feet 5 inches, respectively. You will notice that there is hardly any difference in the size or general character of the skulls. Here is the skull of a 9 feet 1 inch tiger which is much bigger in every way. The skull and frame of a tiger would, however, always be larger and stouter built than a tigress of the same length. Here is the skull of an 8 feet 9 inches tiger. Compare it with the skull of the 8 feet 9 inches tigress and you will see the difference.

Tigers are supposed to breed only once in three years, which is unsatisfactory intelligence for the sportsman. The only reason for

this is that their cubs stay with the mother till they are about two years old; so if the tigress should lose her cubs she would, no doubt, breed again sooner. The period of gestation is said to be thirteen weeks: from two to four cubs are usually brought forth. A litter of five cubs is said by Colonel Peyton (*ubi supra*) to be not uncommon. The late Major Neill, of the Central India Horse, told me of one case in his own experience of six unborn cubs being found in a tigress that was shot. The tigress, however, rarely rears to maturity more than two cubs, and sometimes only one. I have never seen myself a tigress accompanied by more than two well-grown cubs, nor have I seen tracks of a larger number with their mother. Col. Peyton (*ubi supra*) mentions three instances of tigresses having been shot in Canara, when accompanied by a well-grown family of five, and I have heard of more than one authentic instance of four cubs coming out in a beat with their parent. The cubs remain with their mother until they are about two years old. There is no particular breeding season, as young cubs have been found at all periods of the year, but I believe that most of the cubs are born from February to May. I daresay my belief is wrong, but it is based on the age of cubs one sees in the hot weather, the size of their tracks one sees then, and the likelihood that they would be born at a time of the year when the food of the mother is more easily procurable. In the months of March, April, and May the water supply of a country is much diminished, and the deer and hog, which are the natural food of the tiger, necessarily congregate where the water remains, and are not so widely scattered as they are at other seasons, and it follows that the tigress has then less trouble in hunting for her prey than she otherwise would have. Wild animals and birds in Europe are born and hatched at a season when a plentiful supply of their food is produced by Mother Nature. I am not sure, however, that this holds good in the East, where there is no severe cold climate or winter to contend with.

No one seems to know to what age a tiger will live. Individual tigers are well-known to the native shikaris, who have, however, no idea of time as measured by years. They don't know their own ages, and no reliance can be placed upon their accuracy in anything relating to time. The only reliable information I have on the subject is from Colonel J. Hills, of the Engineers, who informed me that he shot a tiger that had been wounded by the district officer of the time, sixteen years before, by an Enfield bullet in the neck.

The bullet was found by Colonel Hills still in the animal. This tiger had one foot smaller than the others, and so his tracks could always be easily identified. He was an adult tiger when hit with the Enfield bullet, and so must, at any rate, have been 19 or 20 years old when shot by Colonel Hills. What is the weight of a tiger I have no personal knowledge. Some years ago, in *The Field*, the weight of a 9 feet 8 inches tiger was given as 355 lbs., and of a 9 feet tigress as 235 lbs., from actual weighments, which is about 25 stone for a tiger and about 17 stone for the lady. Mr. Sanderson in his delightful and accurate book "Thirteen Years among the Wild Beasts of India," says a very bulky well-fed male weighed by him was 349½ lbs. Captain Forsyth, in his "Highlands of Central India," one of the best written books about Indian sport, says that the ordinary tiger weighs 450 or 500 lbs., and that one he shot must have touched 700 lbs. at least. This animal, however, was not weighed. I believe that the majority of tigers are under 350 lbs. I judge, however, entirely from comparison with other animals, such as deer, the approximate weight of which is known to me. It is well known that a tigress teaches her cubs to kill by disabling the animal attacked, so that it cannot escape from the onslaughts of the cubs. Two years ago, I came on an instance of this where the kill was an old bull nilghai, who had been wending his way down a shallow nullah to a water hole. The tigress had been lying in wait about twenty yards from the water behind the stump of a dead tree; there was no cover where she lay: her seat was easily seen in the sandy soil. She had two cubs, about ten months old, with her, but there were no signs of their having lain near her, so, I presume, they were hidden in the jungle until the proper time came. The nilghai had passed within three yards of the tigress, who had rushed out and seized him by the right foreleg just below the shoulder, breaking the bone. The cubs then, I think, had joined in and killed by tearing at the flanks and disembowelling the poor brute. I was out stalking and came on the spot by chance, about 9 A.M. Both hind quarters of the nilghai had been completely eaten. There were no marks on the neck or forequarters except the one grip of the tigress on the right leg. It had been eaten on the spot where it was killed. I took a photograph of the nilghai. You will see there is no mark on the throat, the usual place of seizing. The face of the animal has also a peculiar painful expression, which one never sees on an ordinary kill. The branch of a tree that you

see in the photograph lying almost across the kill was freshly broken off a tree on the bank of the nullah. It appeared to me that after eating the tigress had ascended the bank and reared herself up on her hind legs, resting her forequarters on the branch, which broke with the weight. The tigress and two cubs were sitting close by in the water hole, and gave vent to a series of growls as I approached, but finding I was not intimidated, sneaked off up a kind of ditch overgrown with grass without my seeing them, although I was within fifteen yards. They returned to the nilghai the next night, and finished it. I have here a photograph of the nilghai after the second night. You will see nothing is left except the head, bones of the legs, ribs, and some skin. You will also perceive from the surroundings that the carcase had been dragged to another spot before being eaten. I also returned at daylight, but the tigers had then left. I shot the tigress late in the afternoon. She vomited up large strips of the nilghai's skin in a perfect state, not digested at all, and as I shot her at least twelve hours after she had been eating, it appears that skin is not easily digested. One of the cubs, about the size of a panther, was also killed; the other escaped. Only last week when out stalking in the Easter holidays, I found the carcase of an old bull nilghai that had escaped from a tiger, but died of the wounds inflicted on it, probably from blood-poisoning. It had been dead about a day. The tiger had seized it by the hind leg immediately above the hock, hamstringing the leg. He had also bitten through the other hind leg in the same place, but had not hamstrung this leg. The nilghai had somehow got away. I could not find any other marks of the tiger on it, although there had probably been some scratches with the claws, as the vultures had made a few holes where the skin had, no doubt, been gashed. The holes made by the tiger's teeth were full of maggots bred while the animal was alive, the rest of the carcase being comparatively fresh. I took a photograph of the hind leg, which shows clearly the teeth marks immediately above the hock. You will see they are too large and too wide apart to have been caused by a panther. The large hole shown in the picture in the thick part of the leg had been made by vultures, of which there were many sitting about waiting until decomposition had proceeded far enough to enable them to get through the tough skin. I fancy this tiger must have been a young inexperienced one, or the nilghai would not have got away. Opinions differ as to the

mode in which a tiger usually kills his prey. Some say that he seizes by the throat, others by the nape of the neck from above. I have examined scores of kills with special reference to this point, and in every case (except one) the throat had been seized from below. The exception was an old boar that had been seized by the back of the neck from above. I also once came across a man that had been seized by a man-eater by the nape of the neck. Strange to say he recovered. He was the last of a single file of several villagers, and on the tiger seizing him, his comrades turned and drove the tiger off him. He was insensible, and had no idea when he came to his senses what had happened to him. He eventually recovered. The victim being seized, all authorities agree that the neck is dislocated by a wrench. I have never been able to understand how this dislocation takes place. A wrench, one would suppose, would throw the animal over before dislocation could occur. I have always doubted whether dislocation does take place. I have never noticed any external appearance of it, but I don't place much reliance upon that, as the body is generally stiff before one gets to it. Actual dissection, which one is not usually inclined for under a hot sun, I have never tried. The hunting leopard (the tame one) appears to me to kill by simple pressure on the windpipe; for the ones I saw did not even break the skin with their teeth, and I don't see why a tiger should not kill by that means. If any of you will get a friend to clutch your windpipe with even moderate violence, you will find it renders you quite powerless. It is by pressure on the windpipe that garotters succeed, I have always understood. On the other hand, I have seen more than one instance where adult tigers and panthers having seized have failed to kill, when they have had it all their own way, and not been frightened off. This I cannot account for, as the wounds in the throat in such cases have appeared to be the usual ones. It is only by accident, if at all, that tigers in killing sever any important vein or artery. The natives will tell you that they do and suck the blood. I have never found any blood to speak of that has flowed from the throat wounds. I once heard a tiger take a bullock out of a herd within 300 yards of me and was on the spot immediately. The tiger had sneaked off, either frightened by the shouts of the herdsman, or because he heard me. The bullock was dead. Hardly any blood flowed from the wounds, which were in the usual place in the throat. Very large and powerful animals,

like the bull bison and bull buffalo if attacked at all, are, I think, in the first instance, attacked from the rear with a view to disable them. A few years ago I shot a very large solitary bull buffalo that had been attacked by a tiger in this way a short time before. The tiger had leapt on his quarters, fixing his claws on both sides of the root of the tail, and also fastening on with his teeth. There were long cuts down both hind legs made with the claws. The wounds were healing well, and the buffalo was none the worse. Having killed, the tiger invariably according to my experience (though some writers say he occasionally begins elsewhere), begins eating at the hind quarter. Why he should do so I don't know. He polishes off one hind quarter, and generally both. Sometimes he leaves the stomach and intestines in *statu quo*. Sometimes he will remove the stomach and make a neat parcel of it a little on one side. If a tiger and a tigress are together when they kill, they finish an ordinary-sized animal at one meal, leaving only the head. In such a case, I fancy the second one eats at the fore quarter. I have a photograph here of a bullock killed and partly eaten by two panthers. One, you see, has eaten at the hind, and the other at the fore quarters; and it is probable that tigers would do the same. On the other hand, the tigress and cubs, I told you of, all ate at the hind quarters of the nilghai. Here is a photograph of a wild buffalo calf, killed and partly eaten by a tiger; also one of a larger but tame buffalo similarly treated.

These will give you a good idea of the appearance of the dinner after the tiger's first meal. The latter photo also clearly shows the tiger's grip on the throat when killing. With the exception of the nilghai previously mentioned, I have never seen an animal eaten where it was killed. It is always dragged a short distance, and sometimes for a considerable way, before the eating begins. It is dragged, not lifted clear off the ground. Having gorged himself, he sometimes lies up close to the kill, but as often as not, especially in the hot weather, if there are hills anywhere about, he will go a long distance from the kill before he lies up for the day. I think the reason is that in the hot weather he prefers to get into some cave, or to lie out high up on a hill side under some shady tree where he gets the breeze, rather than stop in the close hot atmosphere of low jungle. At any rate, I have frequently found them pass through very likely looking heavy jungle near the kill, and proceed long distances to hills before lying up. As a general rule, the tiger

returns to his kill the next night as soon as it is quite dark. He then finishes what is left if the kill is an ordinary bullock or deer. He never eats at the place he ate the night before, but drags it forty or fifty yards before beginning operations. If you sit up over a kill it is necessary to tie it by the fore leg to a tree, otherwise the tiger will walk off with it as soon as he arrives. This occurred to me sitting over a natural kill of a boar. The tiger picked it up and walked off without stopping a second. If you tie it, the tiger does not seem to mind, but will stop and eat. He takes about two hours steady eating to finish the forequarters of a bullock. I timed a small tigress two years ago. She came and ate for ten minutes and then went away for twenty minutes, I think to have a drink. She returned and ate without stopping for two-and-a-quarter hours. Just as the moon was getting up, she finished, and walked quietly off. Though I was within ten yards, the whole time up in a tree, I could not see at all, so did not fire. It is no use firing a random shot on these occasions. You probably only wound or miss, altogether frightening the animal out of the country. A little self-control and patience will give you a better chance another day. This particular tigress I turned out in a beat next day, but did not get a shot.

Tigers on occasions are cannibals. The male is said by the natives, probably with truth, to kill and eat the cubs. Mr. Mulock once fired at a tiger, and shortly afterwards fired at what he supposed to be the same tiger. He killed them both, but thought he had only killed one; and so one was left dead in the jungle. A third tiger came during the night and had dinner off it. This tiger also returned the next night, and had another meal. I have a photo here of the tiger so eaten. I have read of other instances of tigers eating the dead carcase of one of their own kind, but have not seen any such instance myself. They will also eat the dead carcase of an animal they have not themselves killed. Mr. Raitt, of the Bombay Uncovenanted Service, was killed by a tiger that the evening before had fed on the body of a bear that Raitt had shot. Tigers are supposed to kill once in five or six days, and this, no doubt, is generally the case, as a tiger does not trouble himself to hunt much for a few days after a heavy feed: but if they get the chance, they will kill whenever they can. A tigress I was after last year killed, on three consecutive nights in different places, never returning to the kill. Some years ago a tigress killed on fourteen consecutive nights. She returned to the same place every night, and found a fresh bullock

tied up in the place of her old kill. We were engaged with other tigers some distance off, hence the necessity of keeping her in the neighbourhood till we arrived. There is no real cruelty in tying out baits for tigers. At any rate, few tigers would be killed without baits, and the one sacrificed saves the lives of all the other animals that the tiger would kill if he was not shot. So on the principle of the greatest happiness of the greatest numbers, tying out would be justifiable. But I also believe that animals killed by a tiger suffer little, if anything, beyond an instinctive panic for a few seconds. Dr. Livingstone has recorded in his travels in South Africa, that when he was seized by a lion, the shock produced a stupor and dreaminess in which there was no sense of pain or feeling of terror, though conscious of all that was happening, and he expresses his opinion that this peculiar state is produced in all animals killed by the carnivora, and is a merciful provision of our Creator for lessening the pain of death. I have conversed with both Europeans and natives who have been boned by tigers and panthers, and they all confirm this view. Animals, until the moment the tiger arrives, are unconscious of their fate, and the probability is that Dr. Livingstone's opinion is well founded; that at the moment of attack they get stupified and insensible to fear or pain. I once saw a bullock in a beat lie down and stretch his neck out flat on the ground, as if for concealment when the tiger approached. After the tiger had been shot, the bullock rose and began grazing. I am inclined to think that the fear of the bullock in this case was caused as much by the noise of the beat as by the presence of the tiger. A tiger sometimes kills immediately after having fed if he comes across a fresh bullock. Last year I shot a tigress that had first killed a stray bullock, about three hundred yards from one of my ties-up. Having eaten the hind quarters, the tracks led to the tie-up. This she killed and dragged away into an adjacent hill. On another occasion, after eating the tie-up a tiger killed five buffalo calves, out of a herd of eight calves that had strayed near. They all lay close together within a space of twenty yards, and not more than 200 yards from where the tiger had been eating. All of them had been seized by the throat, and were otherwise uninjured. It is possible that the tiger in this case had been disturbed by the calves coming near where he was eating, and being annoyed, had sallied forth and killed them. But I do not think so, as I could not find any tracks returning to the kill.

Vultures take good care not to descend on a kill if the tiger is near. They perch on the trees above, and one is often led to a kill by seeing them. If they do descend on the kill, the tiger kills them if he catches them. One I found so killed seemed to have been caught and crushed with the paw. The "sledge hammer stroke of the fore paw of the tiger" one reads about, I have never come across. No kill I have ever seen bore any marks of it. Four men have been seized by tigers either in my immediate presence or when I was close by. In every case the tiger clutched them with his claws, exactly as you might clutch a person's arm with your fingers; and there was no sign of a blow further than you would expect from a violent seizure. Tigers wander immense distances during the night. They are very partial to easy going, and if there are any tigers about, one of the best places to look for their track is along the jungle roads and footpaths, to which they will sometimes keep for miles. They also roll in the dust of the roads, and take a dust bath. They don't like moving in the heat of the day: the hot ground burns the pads off their feet, and makes them quite raw. A wounded tiger I followed a whole day, had the thick leather pad of his paws completely removed from this cause, two days after he was first wounded in the hind legs. This tiger killed a bullock, and made a good meal; when shot his feet were in the state described. They are also fond of sitting in pools of water in the heat of the day. I have three times found them enjoying a cool bath. Tigers seldom climb trees. I have a photograph here of a tree in Salsette that was climbed by a man-eater. He attacked two men: one went up this tree to the fork of the right hand branch, the other escaped. The tiger went up the tree, but could not quite get to the fork where the man was. He then came down and hid in the jungle near. Poor Pandoo, for such was his name, thinking the coast was clear, descended and made tracks for his village, no doubt congratulating himself on his escape, when the tiger seized him and ate him. The inquest report stated "that Pandoo died of the tiger eating him; there was no other cause of death. Nothing was left except some fingers, which probably belonged to the right or left hand." Such was the inquest report. The above facts were stated to me by my friend Mr. Mulock, who took the photo of the tree I have shown you. It seems extraordinary that the remains of Pandoo did not consist of more than some fingers, but I tell the tale as it was told to me.

You would think that a tiger was a conspicuous object in the jungle, but the contrary is the case. His yellow skin blends with the colours of the dried-up grass, and the black stripes correspond with the flickering shadows thrown by the stems of the grass, leaves and branches of the trees, so that when the animal is motionless, it is almost impossible to see it. The real danger of following a wounded tiger on foot is the difficulty of seeing the brute in time for action.

Darwin is inclined to attribute the handsome appearance of the tiger to sexual selection, and considers the theory that its colour is intended as a means of concealment unsatisfactory, and he instances the zebra (who lives on open plains) as an animal, whose stripes can be of no use for that purpose. It is, however, certain that every wild animal, however conspicuous its colours and appearance may be when seen in Zoological gardens, is extremely difficult to make out when motionless in its native wilds; and I have little doubt that a zebra on his native plains would be found not to be so visible an object as at first sight might seem to be the case. At all events if a tiger remains perfectly still, the odds are you will walk right up to him without seeing him. The younger tigers are handsomer than the older ones; the coats of the latter are less vivid in colour and have a faded appearance.

Natives have many pleasing delusions about tigers. They believe that the ghosts of a man-eater's victims ride on his head, warn him of danger, and point the way to fresh victims; and, in one instance I heard of where a shikaree had been killed by a man-eater, the general opinion was it was no use to try for the tiger, as the ghost of the shikaree was up to all the dodges and would infallibly warn the tiger. They also think that you get the courage of the tiger by eating its flesh; that unless the whiskers are singed off, the spirit of the tiger will haunt you, or (as I read in an old book) you will be turned yourself into a tiger in the next world; that the fat of a tiger is a specific for rheumatism, that the number of lobes in the liver correspond with the number of years the tiger has lived, that the claws if worn are a charm against the evil eye. The small bone embedded in the muscles between the shoulder and neck of a tiger is also a charm. This bone is a rudimentary clavicle or collar-bone.

In some places, too, there is a superstition that God allows the tiger one rupee a day for his food, so that if he kills a bullock worth Rs. 5, he won't kill again for five days. If it is worth Rs. 10, he won't kill again for ten days, and so forth. I have also read that

the possessor of the whiskers of a tiger obtains unlimited power over the opposite sex, but I cannot from personal experience vouch for the truth of this statement. I will now wind up this rather desultory paper by showing you the photo of two tigers with their skins taken off. My lady friends tell me this is a nasty one, but nasty or not, it gives you a very good idea of the immense muscular power of a tiger's forearm, and reminds one of the saying that beauty is only skin deep.

NOTES ON THE ORIGIN OF THE BELIEF IN THE BIS-COBRA.

BY J. A. DA GAMA, L.M., K.C.J.C.

(*Read at the Society's Meeting on 7th May, 1888.*)

I HAD the pleasure some time since to listen in these rooms to a very interesting paper by Mr. Vidal on the *Bis-cobra*. Mr. Vidal supposing that the *Bis-cobra* belonged to some one of the lizard families, and that it was a very poisonous lizard, or, according to some, that it was twice as poisonous as the Cobra-de-Capello, says that such an animal as the *Bis-cobra* never existed, because there has not yet been found a poisonous lizard in India. The more one studies the subject on the lines Mr. Vidal takes, the more one feels inclined to yield to the belief that there never has been such an animal in existence, and the descriptions given of it by the natives are a myth. But looking at the subject in a different light, I think that there exists an animal which, in the 16th century, had the name of *Bis-cobra*, but which subsequently came to be known, both scientifically and popularly, by other names, and which is neither a cobra nor a lizard.

When we desire to verify accounts of facts sent down to posterity by tradition, we should not criticise them merely through the improved means of investigation which have been placed in our hands by recent discoveries. It is necessary to transport ourselves to that period of time, when those facts are supposed to have occurred, and we should examine them by having regard to the amount of the information which was available to the people then living, and to various other circumstances which probably may have influenced the

result of their enquiries. You all know what treatment Galileo received for having ascertained the earth's movement. If we were to judge of the result arrived at then through our present knowledge of astronomical subjects, we should be astonished at the condemnation of Galileo by the Inquisitors at Rome for his discovery, which forms the basis of all the astronomical calculations of the present day. But then we must remember that the fact occurred in the year 1615, when superstition and religious autocracy reigned supreme. History has sent down to us accounts of facts which were exaggerated according to the feelings and ways of observation of the writers who wrote when those facts occurred, or were supposed to have occurred. Cobra-de-Capello itself had once been fabulously described and painted in Italy with more hairs on its body than a bear has. Capello in the Italian language means hair and a hood as well. In giving the description of the cobra, the writer, who had never seen a Cobra-de-Capello before, said that it had long, thick and grizzly hair, and illustrated it so. Had not that impression about the cobra been corrected by subsequent travellers in the East, Europeans would still have believed that the Cobra-de-Capello was a *cobra-bear*.

In order, then, to ascertain the existence of the *Bis-cobra*, we must go back to the period of time at which, so far as we can discover the term came into use in India, and find out its origin, and the reasons which lead to its application to the animal, which was given that name, bearing in mind particularly that the term must have been applied to some animal having something to do with the Cobra. It is by means of this method of enquiry that I intend shortly to examine the origin of the belief that such an animal as the *Bis-cobra* existed.

First as to the origin of the term. The term *Bis-cobra* is not of Oriental origin. It is simply a Portuguese expression, which seems to have undergone contraction long since by a process, similar to that which the native servants, jugglers, and vendors use now-a-days to contort English phrases.

The term *Bis-cobra* is *Bicho-de-Cobra* contracted.

The word *Cobra* being, in Portuguese, the equivalent of *coluber* and *anguis* in Latin, the earlier Portuguese in India, with whom the use of the word must have commenced, applied it to all sorts of snakes, and some lizards and worms, but their acquaintance with Natural History being very limited, they naturally classified the

animals they met with, but which they had not seen before according to their most prominent features and appearances. For example, they named the snakes thus : the *nag*, on account of its hood, they called *Cobra-de-Capello* ; the *gonoo*s or the *Daboia*, on account of its beautiful mosaic skin, they named *Cobra-de-Alcatifa*, or carpet snake ; the water snakes they called *Cobras-de-Agoa*, and so on : even some of the lizards they called cobras.

Permit me to read to you by way of illustrating the above stated view, namely, that the earlier Portuguese in India classified the animals they saw, according to appearances, the description of *Cobra-de-Capello* given in his work called "*Oriente Conquistado ao Jesus Christo*," by the Jesuit Father, the Rev. Francisco de Souza. Although this work was published in the year 1710 it had been written previous to the year 1697. It treats of the Portuguese Conquests from the year 1542. I believe that it is the most elaborate and one of the first descriptions of the *Cobra-de-Capello* ever given at that time, although mention is made of the *Cobra* by Garcia de Orta, Fathers Joao Lucena, Daniel Bartoli, Bastian Gonsalves, Fernao Mendes Pinto and others. The despatches from the Portuguese Viceroys and other contemporary authorities and letters from private individuals to their friends also refer to it. The passage, which I translate into English as literally as possible, is as follows :—

"The *Cobra-de-Capello* is so called, because it has a cartilaginous skin on its head, which opens and closes. When it is open, it resembles a monk's hood, and more appropriately a lady with *patas* and *monhos*. [The *patas* and *monhos* were a peculiar head-dress worn at that time by the Portuguese ladies which, spread out on both sides of the face having the concavity forwards.] It is a very ferocious animal. When enraged, it extends its hood, raises half its body from the ground, and throws off such puffs, that with them it kills chickens, hens and middle-sized quadrupeds. Its length is from five to seven spans, and its breadth is proportionate to its length. Its belly is white, the sides yellow and the back of a dark grey with black points. On the open hood there can be seen two perfect SS [*esses*] of a black colour placed side by side. Although it is very fierce, it becomes so charmed at the sound of a juggler's pipe, that it comes out of its hole to enjoy the melody nearer, then the juggler catches it, and shuts it in a basket, and with his tricks so tames it, that he makes it dance along with a rat, but its dancing movements

are limited to moving the upper part of its body from side to side with the open hood, and this at the sound of the pipe and that of a small tambourine, which the country people call 'daca' of 'dak.' On the application of the juice of certain herbs to the nose, it becomes so drowsy that a child seven or eight years old, naked as he is, as I have often seen, takes it in the hand with the greatest ease and confidence, and does what he pleases with it.

"He places it round his neck as a necklace, sometimes across the shoulder, at others around his waist as a belt. Occasionally he puts its head in his mouth, trusting perhaps in the virtues of the herbs he has chewed. The jugglers go about in the villages with these tricks to make their living, but it happens sometimes that the cobra bites them and then it invariably kills them. This cobra is worshipped by the Gentoos, who always rear it in their pagodas, and some of them rear it in their houses out of devotion ; to such kindness the cobra makes a return to its benefactors by killing one of their sons or daughters. The Gentoos say that the machine of the whole world rests on the head of one of these cobras, which must be of a very large size, but when they are asked where does that cobra rest its tail, they do not know how to reply. The most efficacious remedy against the bites of these cobras, and those of any other venomous animals, is the virtue, which a family of idolaters called *Mandrecaros*, has in curing them. The members of that family, by taking little water in their hands out of a well or a fountain, and giving it to drink, and throwing some on the head of the bitten individual, cures him infallibly. Only the males and the unmarried girls of the family enjoy this privilege. They cannot receive any remuneration for the cure. If, however, they accept any money, the remedy loses its efficacy. When any one of them is called to cure a bitten person, and he cannot attend to him personally, it is enough if he sends water which he has drawn by his own hands. Nor is it necessary that he should touch the water. It is sufficient for the purpose if he has drawn it by some vessel. Not long ago a descendant of this family became a convert at Margáo, and after being baptised retained the same virtue. He was employed as an interpreter of the Margáo Church, and seeing him make such easy and admirable cures, I tried to examine the principle and the basis of such a singular prerogative, but he could not tell me anything, except that it was a privilege which his family had enjoyed from centuries immemorial. After this man became a Christian, he had

a son, whom I baptised, and without much ado I say that he actually makes similar cures as his father did before.”

It is said that people believed then, and I think they believe even now, that the Cobra-de-Capello is dreadful not only in its bite, but also in the revenge it takes on any person who molests it. It is supposed that if the cobra is not killed outright when it is once hurt by any person, some time or other it will seek out the offender and kill him. When the cobras are in pair and the male happens to be killed, the female is said to be sure to revenge herself sooner or later on the assassin of the male. It is also said that the cobra will traverse a large expanse of water, such as rivers, lakes, &c., in order to take its revenge.

These are some of the traditions regarding the cobra, and they enable us to compare the information which people had at the time of the Portuguese conquests with that of our own days. I pass now to the other animal, which the word *bis* prefixed to the word cobra brings into existence.

Having shown that the word *cobra* is a Portuguese word, it is not unreasonable to infer that the word which is prefixed to it might also be Portuguese in its origin, and it appears to me that it is so, and that the word is *bicho* made into *bis* by the process of contraction I have hinted at before. The original idea conveyed by the word *bicho* in the Portuguese language is that of an animal which bites, no matter what. Whether it bites man or beast, wood, clothes, or the earth, it is called in Portuguese the *bicho* of such and such a thing. By amplification the term has been applied to all living beings from man and beast to the microscopic bacteria. For instance, the expression *bicho homem* means a man who is a *mischievous animal*, *cunning* and *mischievous-making*. A lion, a tiger, a cobra or any other animal, when it is larger than its ordinary dimensions, or when any one of them has made large depredations, admiration or fear of it would be usually expressed in the Portuguese language by saying “*he um bicho tremendo*,” “it is a tremendous beast.” Any animal, then, that bit the cobra or killed it habitually, would be called *Bicho de Cobra*. With your permission I am going to translate to you a passage on the subject from a book published in Goa in 1563. The author of it is Dr. Garcia de Orta, who lived in Goa for more than thirty years, and who was once the owner of the island of Bombay. It is as follows (he speaks to his friend Dr. Ruano) :—

“In the beautiful island of Ceylon, though it is full of a large

quantity of luscious fruit, birds and wild game ; there is also a large number of serpents, which the people call *Cobras-de-Capello*, and which we would call in Latin *Regulus serpens*. [He meant most probably the king cobra, *Ophiophagus elaps*, a specimen of which we lately had in the cage in the other room.]

“On account of these, God created in that island the *cobra tree*, and its use in cobra bites was discovered, because there are in this island some *bichos* (animals) resembling the *ferrets*, which are called *quil* (others call them *quirpele*), and which very often fight with these serpents. If the *bicho* knows that it is going to fight with a serpent, or if it is afraid of it, it goes and bites a piece of the root of the plant which is above ground, and chews it, then it moistens its hands with the juice of the plant and applies it to the head, and to those parts which it knows the cobra will bite in its spring. It fights with the cobra, biting it and scratching it until it kills it ; if it does not kill the cobra, or if it finds it stronger than itself, then the *bicho* called *quil* or *quirpele* goes to the root, and applies its juice again and repeats the fight with the cobra, and thus kills it and conquers. By these means the Sinhalese came to know that this tree and its root were of use in cobra bites ; and the Portuguese believed in the virtue of this plant, both by what the country people told them, and by what they found out by their own experience, and made use of the plant against the poison. They also saw with their own eyes, that the story of the fight of the *bicho* with the cobra was only too true, and in order that you may be more certain of this if you are not tired, I shall relate to you a thing which a Franciscan friar, worthy of belief and a virtuous man, saw at Negapatam, a continent near that island of Ceylon.” On his friend requesting him to relate the story, he thus continued : “ Many Portuguese men have these *bichos* domesticated and tamed in their houses for killing rats and for fighting with *cobras de capello* which the joguees carry and by means of which they beg alms. These joguees are Gentoos, who go about begging, besmearing their bodies with ashes. They are venerated by the Gentoos, and also by Mussulmans ; they wander about many countries, and know a great many medicines and applications, some of which are true, others are false. Many of these joguees play the trick of *passa-passa*. [This is a trick, which we see nowadays displayed by the jugglers with 3 small cups and 4 or 5 balls, a sleight-of-hand trick.] They carry with them those cobras of which I have spoken before, and after having drugged them they

pull out their teeth and fangs in order to prevent them from doing harm. With this and with a little familiarity, they (the joguees) put them round their arms and necks, and try to make us believe that they are under an enchantment. But I believe it is all a lie. I will relate to you the following case :—

“ ‘ A Portuguese gentleman at Negapatam ’ (and this is the story of the Franciscan friar) ‘ called a joguee who carried cobras with him, and told him to let his cobra fight with his (the gentleman’s) *bicho*, but the joguee having pulled out the fangs of the cobra, wherein consisted all its strength, refused at first, but the gentleman gave him one *cruzado* (about two shillings and fourpence) and he consented. The *bicho* warned for the fight walked at first under the benches and chairs to see if it could smell the root of the cobra tree, but seeing that it could not get it, it daubed itself with its own saliva and came out to fight the cobra, which on seeing it made a dart at its head and slightly bit it twice or thrice, the *bicho* also bit the cobra as many times. Then both somewhat wounded, separated, but the cobra got the worst of the fight. The joguee having got the price of the fight and also the cobra remaining alive (which recovered afterwards) came back with another cobra, which had its fangs, and challenged the gentleman for another fight between the animals, on condition that he should pay him more money because his first cobra was nearly dying and he had brought another. The gentleman only offered him as much as he had paid before. The joguee was quite glad to accept it, because this time his cobra was better armed. The gentleman prepared his *bicho* for the fight, he caressed it first, then brought out for it some roots of the tree which the *bicho* chewed for some time, and taking some of the juice in its hands applied it to its head, loins and belly, and also to its former wounds. The *bicho* being thus prepared, the joguee brought his serpent, which raising half its body from the ground at once darted forward, but the *bicho* avoided its bite by jumping on one side. They went on in this manner for some time, the *bicho* hitting the cobra, and the cobra hitting the *bicho* also ; at length the *bicho* jumped on the cobra’s head or a little behind it, and bit, squeezed, and scratched it so, that when he found that the cobra was completely exhausted, he killed it. The cobra, however, was disabled by the very first bite of the *bicho*, for *the breath of the bicho is poison to the cobra*. Thus was the joguee’s cobra killed, and he left the place broken-hearted.’ ”

This is the passage from Garcia de Orta, who was considered to be the highest authority in Natural History among the Portuguese in India. It was said at that time (and I am sure it is said also now in some places) that this *bicho* not only fought with, and killed the cobras, but that, when hungry, if it happened to spy a cobra, caught it, divided it into three parts, and ate the middle part; then it joined together the remaining two parts, and applied to the wound the juice or the leaf of some plant. The cobra then got well and walked off as quietly as if nothing had happened to it.

About 400 B. C. Aristotle mentioned this animal as being an enemy of serpents, in his *History of Animals*.

Pierre Belon, a French naturalist, who travelled in Greece, Asia, Egypt, Palestine, and Arabia, describes this animal in his *Observations of Singular and Memorable Things* he found in those places.

This book was published in 1555. I give an extract from it in the original French—"Les habitans d'Alexandrie nourrissent une bête nommée *ichneumon*, qui est particulièrement trouvée en Egypt. On la peut apprivoiser és maisons tout ainsi comme un chat on un chien. Le vulgaire a cessé de la nommer par son nom ancien, car il la nomment en *leur langage* rat de Pharaon. Or nous avons vu que les paysans en apportent des petits aux marchés d'Alexandrie, où ils sont bien recueillis pour en nourrir és maisons, à cause qu'ils chassent les rats, les serpents, &c. Cet animal est cauteleux en épiant sa pâture; il se nourrit indifféremment de toutes viandes vives, comme d'escarbots, lézards, chaméleons, et généralement de toutes espèces de serpents, de grenouilles, rats et souris; il est friand des oiseaux, des poules et poulets."

Prospero Alpini, a Venetian naturalist, while acting as physician to the Venetian Consul in Egypt in 1580, had one of these animals with him, and, like *Pips* of Mr. Sterndale, it also proved to him a friend. He describes it in his *Historia Egypti* thus: "*Ichneumon seu Mus Pharaonis. Mihi ichneumon fuit ultissimus ad mures ex meo cubiculo fugandos; unum alui, a quo murium damna plane cessarunt, siquidem quotquot offendebat, interimebat, longaque ad hos necandos fugandosque fele est ichneumon utilior.*" These works were published up to the 16th century.

Engelbert Kaempfer, a German naturalist, who was in India about 1690, is probably the first author who refers to the animal as the Mangoose. In the *Amoenitates Academicæ* of 1693 he refers to the cobra tree also, and he says that the Portuguese called it *Mungo* and

the Dutch *Muncus*. I give an extract from his writings only which refers to the subject. "Primum antidotum.....radix est plantæ malaice *Hampa du Tanah*, id est. Fel terræ, dicta a sapore amarissimoLusitanis ibidem *Raiz* seu radix mungo appellata a mustela seu viverra, Indis *Mungustia* appellata quia radicem monstrasse, et ejus usum."

I could cite passages from other writers of the 17th and 18th centuries, such as Maillet, John Klein, Hasselquist, George Edwards, Linnæus, Albert Seba, Vincent Maria, Buffon, &c., but suffice it to say that they are unanimous in saying that the *Ichneumon* or *mangoose* is *serpenticida* or serpent killer. From this one can easily identify the *mangoose* or *Herpestes* of the present day, and which was once called in Greek and Latin *Ichneumon*, *Mus Pharaonis*, *Donula*, *Donola Mustela*, and in French *Mangôuste*, &c., with the same animal described by Garcia de Orta as *Bicho de Cobra*.

It may be asked, that even granting that the mangoose is the *bis cobra*, how can the idea of its being a poisonous lizard be explained? When Vasco da Gama and his successors, imbued with the adventurous spirit of the age, set out to discover new countries, they fully made up their minds to conquer those countries, and christianise them, and also to appropriate their commerce. This they did by the sword, and while they thrust the Catholic religion on the people, they also forced them to learn the Portuguese language; for both the soldiers and the priests, by whom they were accompanied did not take the trouble to learn the language of the people, but spoke to them in their own. A large number of the converts were kept by the Portuguese as personal servants and military and other retainers, who had to learn the language whether they willed it or not; they picked it up as best they could, and, as it was to be expected, contorted it very much in speaking it. The converts and the priests were the chief factors in disseminating extensively into the country the Portuguese language, and this was done so effectively, that even now, after a lapse of three centuries, the Portuguese language, or a argon purporting to be that language, is spoken in several places which have long since ceased to belong to the Portuguese nation.

The language and the religion are the two indelible traces which the Portuguese have left of their conquests in India. Moreover, a great many Portuguese words have been introduced into the several languages of the country, such as in Marathi, Guzerati, Hindustani,

Tamil, Canarese, Malyalim, Chinese, &c., and the word *bis-cobra* was one of them.

Strange as it may appear, there is another instance of the contraction of the prefix in connection with the word cobra, but in this case the animal is a perfect lizard, and it is not at all poisonous, as it was supposed. There is a brown lizard, about 9 or 10 inches long, with yellow stripes and a forked tongue, which is called "*Tia-de cobra*," in English "*cobra's auntie*." Now the expression in the Portuguese proper is—*tira-se como cobra*—that is to say, "an animal that crawls about like a cobra." And it has undergone a similar process of contortion as the expression *Bicho-de-Cobra*.

As I have said before, the Portuguese in India named the animals they saw here according to their most prominent features; because their knowledge of Natural History was rudimentary; they consequently were not very clear about the Amphibia, Reptilia, Mammalia, &c. They regarded the Mongoose as a reptile, and it may be gathered from the old and new dictionaries that they were right then. A reptile is an animal that moves on its belly or by means of short small legs, such as *caterpillars, lizards, snakes, earthworms*. So say the dictionaries.

Almost all writers, modern writers included, are unanimous in saying that the Mongoose sometimes crawls with its belly on the ground, when occasion arises, to seize its prey; or as Buffon says: "*elle marche sans faire aucun bruit, et selon le besoin elle varie sa démarche; quelquefois elle porte la tête hante, raccourcit son corps, et s'élève sur ses jambes; d'autrefois elle a l'air de ramper et de s'allonger comme un serpent*." Mr. Sterndale says "They are active and sanguinary, chiefly hunting *along* the ground." It is not to be wondered at then, if the Portuguese had an idea that *the bicho-de-cobra* was a lizard reptile.

That the Portuguese certainly regarded the *Mongoose* as a poisonous animal, may be gathered from the writings of Garcia de Orta. The *Oriente Conquistado* says that all lizards are poisonous; they are described therein as having their teeth "*set in different rows and hollow, having enclosed within them smaller ones filled with venom*." In fact the Mongoose was described and taken to be in the last analysis as *that Poisonous Reptile Bicho-de Cobra*. Well then the story of the *poisonous reptile, bicho-de-cobra* or *bis-cobra*, seems to have spread far and wide during the first 70 years or more of the Portuguese conquests in India. Subsequently, however, on the inter-

course between the Portuguese and the natives becoming greater and of a more familiar character, they began to be more observant of the language and other things of the country. They noticed that this animal was called by the natives *Mungutia*, *Mungus*, *Mungli* and by various other names in various places, but that the first two were more prevalent, and they now began also to call it *Mangús*. I have no doubt that the Dutch and the scientific travellers of other nations largely contributed towards generalising its native name, *Mangoose*.

As years rolled on, the Portuguese, the naturalists and the natives all called the animal Mangoose, and thenceforth the Portuguese term *Bis-cobra* fell into oblivion, but among the natives the idea of the *poisonous reptile Bis-cobra* still remained, and it has been handed down together with the exaggerated accounts of its tremendous poisonous properties.

The natives still believe in its existence, but they, like the Mussulmans of Cowper, are uncertain which animal was meant. Most probably having got an idea that it must have been a reptile, they have a suspicion that it is a lizard. Here then, I think, is the origin of the belief which the natives have in the poisonous lizard *Bis-cobra*.

BUTTERFLIES AND ANTS.

(With Plates Nos. 26 and 27.)

By LIONEL DE NICÉVILLE, F. E. S.

(Read at the Society's Meeting on the 7th May, 1883.)

THAT there should be any connection between butterflies and ants is, I believe, known to few, though as regards one family of butterflies at least this relation is a very close and intimate one. As a rule, ants are the most deadly and inveterate enemies of butterflies, and ruthlessly destroy and eat them whenever they get the chance, as I have frequently found to my sorrow, when in a single night a fine brood of larvæ has been carried off by ants from the food-plant growing in tubs in my verandah, and not a single one has been left by the morning. In the case, however, of the larvæ and pupæ of some *Lycænidae*, not only do the ants restrain their natural appetites by not eating these tempting morsels,

but they take the greatest care of the larvæ, defend them from their enemies to the best of their ability, and when they are about to turn to pupæ, conduct them to a safe place, where they may perform their transformations, and allow the newly-emerged and at first helpless butterflies to escape unmolested.

On the penultimate or twelfth segment of these *Lycænid* larvæ on the upperside are two erectile tentacula, and on the eleventh segment on the upperside in the dorsal line is an oval opening from which exudes a sweet liquid, of which the ants are inordinately fond, and to obtain which their care and attention of the larvæ is entirely due. The two tentacula on the twelfth segment do not apparently give off any fluid, and I have a theory, whether correct or no I cannot prove, that they were originally developed in the larvæ to drive away their enemies, probably *Ichneumon*-flies, much as the tentacula behind the heads of *Papilio* larvæ are used. In the larvæ of the genus *Curetis*, which do not appear to be affected by ants, these tentacula are very large, and when the insect is touched, they are extended with lightning-like rapidity and whirled round with great velocity. On Plate No. 26 will be found two enlarged figures of the larva of *C. thetys*, Drury, bred by me in Calcutta, also an enlarged figure of its curious jelly-like pupa. In the genus *Curetis* the tentacula are very long, much longer than any other *Lycænid* larvæ known to me, and furnished at the apex with a tuft of long hairs forming a rosette, very similar in appearance to the anal tufts which the males of butterflies of the sub-family *Danaïnae* can thrust out at will. *Curetis* larvæ appear to have no honey-gland, so ants do not attend them, nay, would probably eat them with much relish if they came across them, and were not frightened away by the rapidly-whirling tentacula. In the larvæ with the honey-gland these tentacula are much smaller and have short hairs at the apex; in these larvæ they are probably becoming aborted from want of use. In the larvæ of the genus *Virachola*, which feed in the interior of certain fruits, I have been unable to discover that they possess either a honey-gland or tentacula. They are not therefore, I believe, attended by ants, though Mr. W. C. Taylor and his daughter, Mrs. Wylly, hold to the contrary opinion, from observations they have made on the habits of these larvæ.

M. Guenée seems to have been the first to notice the existence of these organs in the larvæ of *Polyommatus bæticus*, Linnæus, which occurs in France as well as in India and elsewhere. This was in

1867. Mr. Moore, in Vol. I. of his "Lepidoptera of Ceylon," published in 1881, quotes a note by Dr. Thwaites, who observed that certain formicidians attended the larvæ of some *Lycænids*; the species are not stated. Again, in 1886, Mr. W. Doherty records certain observations of his on the same subject. But Mr. W. H. Edwards has given in "The Canadian Entomologist," Vol. X., p. 1, *et seq.*, the fullest account I have seen of these organs and their use, and I have copied (Plate No. 27) a woodcut of the posterior segments very much enlarged of the larvæ of *Lycæna pseudargiolus*, Boisduval and Leconte, a North American butterfly, which he gave to illustrate his remarks. In Calcutta I have found that the larvæ of over a dozen *Lycænidæ* are affected by ants. I collected specimens of the latter, and have had them identified by Dr. Forel of Geneva, a great authority on ants. I now give the observations of a valued correspondent (Mrs. Wyll) on the same subject, and hope that others will follow up the matter, as there is still much to be learnt as to what species of *Lycænidæ* are affected by ants, what ants perform the offices of "milkers" and guardians to the larvæ, and what larvæ possess these special organs.

That ants attend *Aphides* (plant-lice), many Homopterons, *Cossidæ*, &c., in much the same way and for the same purpose, is well known, and it seems unnecessary to make any special reference to the fact beyond just mentioning it. This is what my correspondent has to say on the subject :—

"The larvæ of *Tarucus theophrastus*, Fabricius, are cultivated and protected by the large common black ants of Indian gardens and houses. The caterpillar, which varies in colour from light pure green to a dark reddish tint [this is a common variation in *Lycænid* larvæ] is about three-quarters of an inch long, louse-like in shape, and slow in movement, and it feeds on the *Zizyphus jujuba*, a small thorny bush of the jungles, with an edible astringent yellowish fruit, the "Byr-coolie" of the natives. Some *Lycænidæ* larvæ have the power of protruding and retracting at will two small fleshy tentacles or horns, each tufted with a brush of fine hairs, from the upper surface of the tail segments. Between [on the next segment anteriorly] these tentacles is a small slit, from which they exude a small drop of a juice of some sort eagerly sought by the ants, and which they can generally procure by stroking the larvæ gently with their antennæ. The ants set up what appears to be merely a temporary nest at the foot of the tree, the better to carry on their operations. Just

before the rains set in, about the middle of June, great activity among the inhabitants of a *Zizyphus* tree may be observed. The ants are busy all day long running along the branches and leaves in search of the larvæ, and without fail an ant will come on one full-grown, and meditating on the choice of a snug retreat [in which to turn to a pupa]. A friend or two turning up, the ants set to work to guide and drive their caterpillar in the direction they wish him to go, *i.e.*, down the stem of the tree towards their nest. This is not always an easy business if the prisoner is refractory and would prefer going somewhere else. But as a rule they are docile and easily led. Having kept guard over him until they get him safely into his proper berth in the row, and he has accepted their ultimatum as final, he drops off into the preliminary doze, and undergoes his transformation into a pupa. If you gently scrape away the loose earth piled up at the base of the tree, you will see some hundreds of larvæ and pupæ in all stages of development arranged in a broad even band all round the trunk, and lightly covered with earth. The ants object to their being uncovered, and will immediately set to work to recover them, and if you persist, they will remove all the chrysalids and bury them lower down. When the butterfly is ready to emerge, which is in about six or seven days, it is tenderly assisted to disengage itself from its shell, and should it be strong and healthy, it is left undisturbed to spread and strengthen its wings and fly away. But if by any mischance, it emerges deformed and too crippled to use its wings a catastrophe occurs. In one case a butterfly had fallen to the ground before its opening wings had dried, and one of the soldier-ants tried to rescue it. He carried it back to the tree with the utmost care and made several attempts to assist the butterfly to hold on again. Finding his efforts unavailing, he left the cripple for a short time to recover itself. On his return, seeing no improvement, he appeared to lose patience, and rushing in bit off both the deformed wings at the base, and carried off the wingless body into the nest below, whether as food for the community, or for what other purpose, I was unable to ascertain. That was the only occasion on which I ever saw any high-handedness on the part of the ants, though their usual ill-temper requires no very close observation to detect. It is curious sight to watch the fragile and delicate newborn butterflies wandering about, all feeble and helpless, amongst the busy crowd of coarse black ants, and rubbing shoulders in perfect safety with the ordinary

fierce big-headed soldiers ; as odd a contrast as the fresh creamy whiteness of the opening wing, the flash of purple and blue, and the sparkle of green and silver eyes is to the darkness and dinginess of their queer home. For some time after the butterflies have gained strength to fly away, they remain hovering over the nest. A larva of a species of *Catopsilia* [one of the *Pierinæ* or 'Whites'] I threw down as an experiment, was immediately set upon and torn to pieces in a second by the ants."

"I took a *T. theophrastus* larva from a tree, and introduced it on the pathway of another company of the same species of ants who lived in our verandah, but kept no 'farm.' and it was odd to see the ants come tumbling out headlong to fight the intruder, and the sudden way they cooled down on investigation of the foe. None attempted to harm him, and he was politely escorted across their boundary, the ants running alongside, and feeling him all over with their antennæ. This must have been instinct, as they could have had no former knowledge of him as a "milk-giver." The dead chrysalids in an ants' nest are carefully removed and thrown away outside ; the ants also distinguish between the dead and living."

ON THE LEPIDOPTERA OF KARACHI AND ITS NEIGHBOURHOOD.

By COL. C. SWINHOE, F.L.S., F.Z.S., &c.

(Continued from page 134.)

PSEUDO-DELTOIDES.

THERMESIIDÆ.

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Azazia rubricans.

Ophiura rubricans, Boisd., Faun. Lep. Mad., p. 106
pl. 16, f. 1 (1834).

Thermesia transducta, Walker, xxxiii., p. 2058, ♂ (1865.)

Thermesia consueta, Walker, Char. undescribed. Lep. Het.
p. 93 (1869).

June to January.

DELTOIDES.

HYFENIDÆ.

123

*Rhynchina xylina.**Rhynchina xylina*, Swinhoe, P.Z.S., 1886, p. 452.
July, 1886.

124

*Hypena laceratalis.**Hypena laceratalis*, Walker, xvi., p. 60 (1858).
July, 1886, in great numbers.

125

*Hypena mimicalis.**Hypena mimicalis*, Swinhoe, P.Z.S., 1885, p. 471,
pl. 28, f. 618.
October, 1886. A pair taken on board the steamer leaving Karachi.

HERMINIIDÆ.

126

*Byturna digramma.**Bocana digramma*, Walker, xxxiv., p. 1170 (1865).
June, 1886 and September, 1886.

127

*Aginna robustalis.**Herminia* (?) *robustalis*, Guén., Delt. et Pyral, 58, 66, ♀
(1854).
Bocana turpatalis, Walker, xvi., p. 174 ♂ ♀ (1853).
January, 1886.

128

*Rivula sericealis.**Pyralis sericealis*, Denis, Wien. Verz., p. 122, n. 18, (1775).
Noctua munda, Berl. Mag. iii., p. 296.
Rivula limbata, Herr.-Schäff., Eur. Schm. vi., 4475.
Common in almost every month of the year.

129

*Rivula flavonigra.**Rivula flavonigra*, Swinhoe, P.Z.S., 1884, p. 522, pl. 47, f. 15.
Common from September to March.

130

Myana sopora.

Myana sopora, Swinhoe, P.Z.S., 1884, p. 522, pl. 48, f. 5.
January and March, 1880.

131

Myana atromacula.

Myana atromacula, Swinhoe, 1884, p. 523, pl. 48, f. 5.
February, 1880.

PYRALES.

BOTYDIDÆ.

132

Botys iopasalis.

Botys iopasalis, Walker, xviii., p. 652 (1859).
Common from May to September.

133

Botys incoloralis.

Botys incoloralis, Guén., Delt et Pyral., p. 332, 369 (1854).
September to December.

134

Botys sublittoralis.

Botys sublittoralis, Walker, xxxiv., p. 1452 (1865).
July and August, 1885.

135

Botys abstrusalis.

Botys abstrusalis, Walker, xviii., p. 663 (1859).
July to November. This insect, which is common in many parts
of India, will have to be re-named, as it not identical with Walker's
type, which came from Java.

136

Ravanca creonalis.

Botys creonalis, Walker, xviii., p. 579 (1859).
,, *neoclesalis*, Walker, xviii., p. 635.
,, *suspicalis*, Walker, xviii., p. 667.
,, *connectalis*, Walker, xviii., p. 1411 (1855).
August, September and October, 1886.

137

Ebulea catalaunalis.

Botys catalaunalis, Dup., Lep. Fr., viii., p. 330, pl. 232, f. 8 (1831).

Margaritia ciliaris var., Steph., Cat. Brit. Lep., p. 239 (1850).

Botys venosalis, Walker, xxxiv., p. 1401 (1865).

May and June; October and November, common.

138

Scopula vinctalis.

Scopula vinctalis, Walker, xxxiv., p. 1476 (1865).

April and May, 1885.

139

Scopula palmalis.

Scopula palmalis, Swinhoe, P.Z.S., 1884, p. 525, pl. 48, f. 11.

September, October and November.

140

Udea fotalis.

Scopula fotalis, Swinhoe, P.Z.S., 1885, p. 875, pl. 57, f. 9.

September and October, 1885; August to October, 1886, in great numbers.

141

Nymphula interpunctalis.

Pyrallis interpunctalis, Hübn., Pyral., ii., 11, pl. 19, f. 128 (1797).

„ *undalis*, Hübn., Pyral., pl. 14, f. 90.

May to August, common.

142

Godara comalis.

Pioneer comalis, Guén., Delt. et Pyral., p. 368, n. 453, ♂ (1854).

„ *incomalis*, Guén., Delt. et Pyral., p. 369.

Common in nearly every month of the year.

MARGARONIDÆ.

143

Glyphodes fessalis.

Glyphodes fessalis, Swinhoe, P.Z.S., 1886, p. 459, pl. 41, f. 3.

May, June and October.

144

Phakellura indica.

Eudiotis indica, Saunders, Trans. Ent. Soc., 1851, p. 163
pl. 12, f. 5, 6, 7.

Phakellura gazorialis, Guén., Delt. et Pyral., p. 299, n.
304 (1854).

June to October. common.

145

Cydalimia conchyalis.

Margarodes conchyalis, Guén., Delt. et Pyral., p. 303, n.
317, pl. 8, f. 9. (1854).

On board the steamer leaving Karachi, October, 1886.

146

Cydalima submarginalis.

Botys submarginalis, Walker, xxxiv., p. 1414 (1865).

August to September, common.

147

Pygospila tyres.

Phalæna (Pyralis) tyres, Cram., Pap. Exot., vol. iii., p. 124,
pl. 263, f. C., ♀ (1782).

Pygospila costiplexalis, Guén., Delt. et Pyral., p. 313,
♂ (1854).

July and August, 1886, in great numbers.

148

Noorda blitealis.

Noorda blitealis, Walker, xix., p. 979 (1859).

Scopula subjectalis, Walker, xxxiv., p. 1472 (1865).

July and August, 1886, in great numbers.

ASOPIDÆ.

149

Hymenia fascialis.

Phalæna (Pyralis) fascialis, Cram., Pap. Exot., iv., pl. 398
f. O. (1782).

Phalæna angustalis, Fabr., Mant. Ins., p. 309 (1787).

„ *recurvalis*, Fabr., Ent. Syst. iii., 2, p. 237, n. 407
(1794).

Hymenia diffascialis, Hübn., Verz. Bek. Schm., p. 361
(1825-27).

Hydrocampa albifascialis, Boisd., Faun. Ent. Madag., Lep.,
p. 119, pl. 16, f. 1 (1834).

June to December, common.

150

Coptobasis lunalis.

Botys lunalis, Guén., Delt. et Pyral., 352, n. 417 (1854).

„ *thyasalis*, Walker, xviii., p. 736 (1859).

August, 1886.

151

Coptobasis opisalis.

Coptobasis opisalis, Lederer, Ent. Mon., vii, 482, pl. 16,
f. 10 (1863).

On board the steamer leaving Karachi, October, 1886.

152

Leucinodes orbonalis.

Leucinodes orbonalis, Guén., Delt. et Pyral., p. 223, n. 187
(1854).

August, 1886.

SPILOMELIDÆ.

153

Synclera traducalis.

Eudiotis traducalis, Zeller, Lep. Micro. Caffr., Kongl. Vet.
Abrad. Handb., p. 54 (1852).

Synclera retinalis, Lederer, Wien. Ent. Mon., i., p. 100
(1857).

Glyphodes univocalis, Walker, xvii., p. 499 (1859).

Synclera traductalis, Lederer, Wien. Ent. Mon., vii.,
p. 445 (1863).

June to December.

154

Haritala cassusalis.

Zebronia cassusalis, Walker, xvii... p. 477 (1859).

„ *aurolinealis*, Walker, xvii., p. 478.

„ *amcenalis*, Walker, xxxiv., p. 1352 (1865).

Botys signatalis, Walker, xxxiv., p. 1444.

„ *faustali*, Lederer, Wien. Ent. Mon., vii., p. 375, pl.
10, f. 15 (1863).

Notarcha cassalis, Meyrich, Trans. Ent. Soc., 1834, p. 311.

July to October.

ENNYCHIDÆ.

155

*Pachyzancla mutualis.**Botys mutualis*, Zeller, Ley. Microsp. Caffr., Kongl. Vet.

Abad. Handl., p. 40 (1852).

,, *stultalis*, Walker, xviii., p. 669 (1859).

June to December, 1885; July, 1886.

156

*Helylepta abruptalis.**Asopia* (?) *abruptalis*, Walker, xvii., p. 371 (1859).

August, 1885, and September, 1886.

157

*Rhodaria arida.**Rhodaria arida*, Bulter, P. Z. S., 1881, p. 621.

May, 1880.

158

*Rhodaria juncturalis.**Rhodaria juncturalis*, Walker, xxxiv., p. 1233 (1865).

August, 1886.

HERCYNIDÆ.

159

*Herbula meleagrisalis.**Herbula meleagrisalis*, Walker, xviii., p. 324 (1865).

Common from February to August.

STENIDÆ.

160

*Spanista ornatalis.**Asopia ornatalis*, Dup., Lep. France, viii., p. 207, pl. 223,
f. 8 (1831).*Botys saturalis*, Treit. Schler Eur. Schm. Suppl. 2, p. 29.*Cataclysta* (?) *elutalis*, Walker, xvii., p. 448 (1859).*Pyrallis deciusalis*, Walker, xix., p. 905 (1859).

September and October, 1885; July, 1886.

161

*Lepyrodes geometralis.**Lepyrodes geometralis*, Guéu., Delt. et Pyral., p. 278, pl. 8,
f. 6. (1854).

June to December, common.

HYDROCAMPIDÆ.

162

Parponyx affinialis.

Parponyx affinialis, Guén., Delt. et Pyral, 270, p. 25
(1854).

July to October, common.

163

Oligostigma incommoda.

Oligostigma incommoda, Butler, P. Z. S., 1881, p. 180.

November, 1879.

164

Hydrocampa tenera.

Hydrocampa tenera, Butler, P.Z.S., 1883, p. 167.

January and May, 1880.

PYRALIDÆ.

165

Pyralis gerontesalis.

Pyralis gerontesalis, Walker, xix., p. 896 (1859).

„ *lunatella*, Walker, xxvii., p. 124, ♂ (1863).

„ *despectalis*, Walker, xxxiv., p. 1243 (1865).

„ *miseralis*, Walker, xxxiv., p. 1244.

January, 1880 ; December, 1885 ; May and July, 1886.

166

Pyralis suffusalis.

Pyralis suffusalis, Walker, xvii. 390 (1859).

Tatta, August, 1886.

167

Pyralis uberalis.

Pyralis uberalis, Swinhoe, P.Z.S., 1884, p. 523, pl. 48,
f. 10.

May, 1879.

168

Pyralis rubicundalis.

Pyralis rubicundalis, Swinhoe, P.Z.S., 1885, p. 564.

June and September, 1885.

169

Stenmatophora ingrata.

Stenmatophora ingrata, Butler, P.Z.S., 1881, p. 621.

May, 1880.

170

Hellula undulalis.

Phidæna undulalis, Fabr., Ent. Syst., iii., 2, p. 226 (1794).

Scoparia alconalis, Walker, xix., p. 827 (1859).

„ *optatusalis*, Walker, xix., p. 1018.

May and June ; November and December common.

171

Hypotia vulgaris.

Hypotia vulgaris, Butler, P.Z.S., 1881, p. 621.

Common all the year round.

172

Hypotia cafera.

Hypotia cafera, Swinhoe, P.Z.S., 1884, p. 523, pl. 48. f. 8.

August, 1880 ; October, 1885.

173

Hypotia rubella.

Hypotia rubella, Swinhoe, P.Z.S., 1884, p. 523, pl. 48, f. 9.

January and August, 1880. Received from Lindi, February, 1886,
and from Hyderabad, April, 1886.

SCOPARIDÆ.

174

Nemophila hybridalis.

Pyralis hybridalis, Hübn., Pyral., 29, 20, pl. 17, f. 114.
(1797).

Tinea noctuella, Wien. Verz., p. 136, n. 35.

Nemophila noctuella, Lederer, Wien. Ent. Mo., vii., p.
379 (1863).

Common in nearly every month of the year.

175

Scotormera tristis.

Scotormera tristis, Butler, P.Z.S., 1881, p. 623.

March, 1880, September and November, 1886.

176

Dosara calatalis.

Dosara calatalis, Walker, xix., p. 829 (1859).

September and November, 1885 ; July and August, 1886, in
great numbers.

GEOMETRES.

ENNOMIDÆ.

177

Hyperythra phantasma.

Hyperythra phantasma, Butler, P. Z. S., 1881, p. 615.
February and March.

178

Hyperythra swinhoei.

Hyperythra swinhoei, Butler, Ann. and Mag. Nat. Hists.
(1880), (5) vol. v., p. 223.

BOARMIDÆ.

179

Boarmia cornaria.

Boarmia cornaria, Guén., Phal., i., 245, 390 (1857).
June, 1835; March, April and August, 1886.

180

Hypochroma dispensata.

Hypochroma dispensata, Walker, xxi., p 485 (1869).
January and June, 1880.

181

Hypochroma pseudo-terpnaria.

Hypochroma pseudo-terpnaria, Guén., Phal, i., p. 276 (1857).
January and June, 1880.

LAARENTIDÆ.

182

Lycanges albatrus.

Lycanges albatrus, Swinhoe, P. Z. S, 1885, p.862, pl. 56, f. 5.
October, 1886.

183

Lycanges demissus.

Lycanges demissus, Swinhoe, P. Z. S., 1886, p. 456.
August and September, 1886.

184

Lycanges defamataria.

Acidalia defamataria, Walker, xxii., p. 752 (1861).
October, 1885.

GEOMETRIDÆ.

185

Thalera diatomata.

Timandra (?) *diatomata*, Walker, xxvi., p. 1616 (1862).

June to December, common.

186

Nemoria frequens.

Nemoria frequens, Butler, P. Z. S., 1881, p. 616.

Common all the year round.

187

Nemoria parvulata.

Nemoria parvulata, Walker, xxvi., p. 1559 (1862).

September, 1886.

188

Nemoria pruinosa.

Nemoria pruinosa, Butler, Ann. and Mag. Nat. Hist. (1880). (5), Vol. v., p. 224.

September to December, common.

IDÆIDÆ.

189

Idæa actuaria.

Acidalia actuaria, Walker, xxii., p. 752 (1861).

August, September and October, 1896.

190

Idæa distracta.

Acidalia distracta, Butler, P. Z. S., 1881, p. 616.

May, 1880.

191

Idæa inductata.

Acidalia inductata, Walker, xxiii., p. 792 (1861).

September to February, common.

192

Idæa invalida.

Acidalia invalida, Butler, Ann. Mag. Nat. Hist. (1879), (5) Vol. iv., p. 439.

May and December.

193

Idæa jacta.

Idæa jacta, Swinhoe, P. Z. S., 1884, p. 526, pl. 48, f. 12.
September, October and November, common.

194

Idæa remotata.

Acidalia remotata, Guén., Phal., i., p. 458, n. 762 (1857).
June, 1880; February, 1886.

MACARIDÆ.

195

Macaria lithina.

Tephрина lithina, Butler, P. Z. S., 1883, p. 171.
January and March, 1880; May, June and September, 1886.

196

Macaria streniataria.

Macaria streniataria, Walker, xxvi., p. 164 (1862).
December, 1885; May, 1886.

197

Macaria strenuata.

Macaria strenuata, Walker, xxvii., p. 1646 (1862).
Common all the year round.

198

Tephрина arenaria.

Tephрина arenaria, Swinhoe, P. Z. S., 1884, p. 527, pl. 48, f. 13.
December, 1880.

199

Tephрина peremptaria.

Macaria peremptaria, Walker, xxiii., p. 929 (1861).
November and December, 1880; and October, 1885.

FIDONIDÆ.

200

Sterrhia sacraria.

Phalæna sacraria, Linn., Syst. Nat., i., 2, p. 863, n. 220
(1766).

Geometra sanguinaria, Esper., Schmett, v., 173, pl. 30, f.
10, 11.

November, 1880; May, June and October, 1885.

201

Fidonia albofuscia.

Fidonia albofuscia. Swinhoe, P.Z.S., 1884. p. 527, pl. 48, f. 14.
September, 1880, and July, 1886.

EPHYRIDÆ.

202

Cyclophora fluidaria.

Ephyra fluidaria. Swinhoe, P.Z.S., 1885. p. 856, p. 10,
pl. 53, f. 10.
August and October, 1886.

EROSIDÆ.

203

Erosia adjutaria.

Doan's adjutaria. Walk., Cat. Ceylon Ins.

Erosia adjutari. Walker, xxiii., p. 849 (1861).

„ *certivaria.* Felder, Reise Novara, pl. 128, f. 7 (1874).

„ *theclata.* Guenée. Phal., ii., p. 36 (1857).

July, 1886.

204

Erosia hyperbolica.

Erosia hyperbolica. Swinhoe, P. Z. S., 1884, p. 528,
pl. 48, f. 15.

May, 1880.

GRAMBITES.

GALLERIDÆ.

205

Melisoblyptus bipunctatus.

Melia bipunctana. Haworth, M. S., Curtis, Brit. Ent., v.,
p. 201 (1828).

Tinea sociella. Hübner, Eur. Schm., Tinea, pl. 4, f. 24, v.,
p. 201.

Galleria anella. Zink.-Som., Germ. Mag. Ent., iv., p. 243.

Lamoria planalis. Walker, xxvii., p. 88 (1863).

Acrobasis imbellis. Walker, xxx., p. 955 (1864).

June, July and August 1886, in numbers.

CRAMBIDÆ.

206

Apurima xanthogastrella.

Apurima xanthogastrella, Walker, xxvii., p. 194 (1863).

Rupela degenerella, Walker, xxxvi., p. 524.

Lithosia cramboides, Walker, xxxi., p. 230.

September, 1885.

207

Crambus Zonellus.

Crambus Zonellus, Swinhoe, P.Z.S., 1884, p. 528, pl. 48, f. 16.

May, 1880 ; June, July and August, 1885 ; April, 1886.

208

Jartheza chrysographella.

Chilo chrysographella, Kollar, Hüg. Kasch., iv., p. 494 (1848).

April to October, common.

209

Schænobius bisignatus.

Schænobius bisignatus, Zeller, M. S., in coll. B. M., Swinhoe, P.Z.S., 1885, p. 461.

October and November, 1885.

210

Eromene bella.

Tinea bella, Hübner, Tinea, f. 60 (769).

September and November, 1885 ; July, 1886.

211

Surattha albipennis.

Surattha albipennis, Butler, P. Z. S., 1886, p. 383.

October, 1885.

PHYCIDÆ.

212

Nephopteryx figuella.

Nephopteryx figuella, Zeller, Walker, xxvii., p. 487 (1863).

September, October and November, 1885.

213

Pempelia illella.

Pempelia illella, Swinhoe, P.Z.S., 1884, p. 529, pl. 48, f. 6.

December to May.

214

Mella zinckenella.

Phycis zinckenella, Treit., Schmiett. Eur., ix., 1, p. 201.

„ *itiella*, Vreit., loc. cit., x., 3, p. 276 (1835).

Mella dymnusalis, Walker, xix., p. 1018 (1859).

April and May; October, November and December, common.

TORTRICIDÆ.

215

Pædisca decolorana.

Pædisca decolorana, Freyer, Neue Beitr., p. 318, pt. 5, 48, (1831-58).

February and May, 1880.

216

Hemirosia aurantina.

Hemirosia aurantina, Pryer, Cist. Ent., ii., 235.

July and August, 1886.

217

Tinea glabrella.

Tinea glabrella, Walker, xxviii, p. 478 (1863).

February, 1886.

218

Hapsifera churnea.

Hapsifera churnea, Butler, P. Z. S., 1881, p. 625.

September and October.

219

Eriocottis fuscanelle.

Eriocottis fuscanelle, Zeller, Isis, p. 813 (1847).

May, 1880.

220

Aluvona cossusella.

Aluvona cossusella, Walker, xxxv., p. 1816 (1866).

June, 1885.

GELECHIDÆ.

221

Ypsolopus robustus.

Ypsolopus robustus, Butler, P. Z. S., 1883, p. 174.

February, September and December.

PTEROPHORIDÆ.

222

Aciptilia congrualis.*Aciptilia congrualis*, Walker, xxx., p. 943 (1864).

February and May, 1880.

223

Aciptilia ischnodactylus.*Aciptilia ischnodactylus*, Treit., Lep. Eur., x. 3, 232.

October, 1885.

NOTES ON SOME BEES AND WASPS FROM BURMA.

BY CAPTAIN C. T. BINGHAM, Deputy Conservator of Forests, Rangoon.

BELOW I give a list of a few bees and wasps that I have collected in Burma, with notes as to their habits, time of appearance, &c. I have been collecting Hymenoptera in various parts of Lower Burma for the last four years, but have only been able to identify a very few of the species procured.

Literature on the subject is not only scarce, but consists to a large extent of papers scattered through various scientific journals, proceedings of societies, &c.—papers it is next to impossible for a collecting naturalist in India to get together and carry about with him.

The nomenclature I have adopted in this list is that of the British Museum catalogue of hymenopterous insects.

The more striking orders of the Lepidoptera and Coleptera can even in India count their students by scores. Hymenoptera have been woefully neglected. My object in writing this paper is to draw the attention of collectors to this fascinating group of insects:—

Haliectus xanthognathus, Smith.

A pretty little bee, swarming about flowering trees from May to August. I have procured it at Henzada, Bassein and Rangoon. Originally described from Northern India.

Megachile dimidiata, Smith.

Common through the hot weather and rains, and coming like most of the other leaf-cutter bees, into the verandahs and rooms of

our wooden houses here, and selecting crevices and holes for their nests.

Megachile conjuncta, Smith.

Megachile rufipes, Smith.

Procured at Bassein only. The male of *conjuncta* is often considerably smaller than the female, and has the face covered with white instead of black pubescence.

Megachile disjuncta, Fabricius.

Commonest of all of this genus. The width of the white band across the back differs considerably in individuals *inter se*. I have watched this bee cutting off and carrying away circular pieces out of the leaves of the guava.

Megachile fraterna, Smith.

Not uncommon in the Pegu hills in November and December.

Crocisa histrio, Fabricius.

Of very wide distribution—India, France, Russia and Algeria. The blue interrupted bands on the abdomen vary in width in different specimens.

Anthophora zonata, Linnæus.

Anthophora confusa, Smith.

Henzada, Bassein, Rangoon: found throughout the year: in abundance during the rains. I have invariably found these bees keeping low down and buzzing about flowering shrubs and even grasses.

Xylocapa latipes, Drury.

Xylocapa æstuans, Linnæus.

Xylocapa olivieri, St. Fargeau.

These are the great carpenter bees, sometimes mistaken for and called "humble-bees" by people in India. The true humble-bee, *Bombus*, is of course quite different.

The carpenter bees are very destructive to dry timber of any kind. I have seen a log even of the hard ironwood, Pyngado (*Xylia dolabriformis*), full of bee holes.

X. olivieri seems rare, and to be crepuscular in its habits. I have procured it only at Pegu.

Bombus eximius, Smith.

Procured on Moeleyit, Dawnat mountains, at an elevation of about 4,500 feet.

Apis dorsata, Fabricius.

This is the common honey bee of Burma.

Scolia, quadri-pustulata, Fabricius.

A very variable insect, with the front of the prothorax however invariably yellow. Found on flowers, May to September.

Scolia decorata, Burmeister.

Scolia instabilis, Smith.

Scolia modesta, Smith.

Found on flowers, May to September.

Scolia aureipennis, St. Fargeau.

Rare ; procured near Thayetmyo in October. Originally described from the Gambia, South Africa.

Scolia (Elis) annulata, Fabricius.

Scolia (Elis) iris, Burmeister.

Found on flowers, May to August. Heavy and sluggish ; easily caught.

Scolia imita, Smith.

A very lovely species, the rust-red down on the last four segments of the abdomen having a very rich sheen, and contrasting well with the jet black of the thorax and the coppery iridescence of the wings.

Scolia aureicollis, St. Fargeau.

Scolia ruficeps, Smith.

Scolia erythrosoma, Burmeister.

Fairly common from June to October.

Pompilus analis, Fabricius.

Rare ; procured in December in the Pegu Hills at about 1,000 feet elevation.

Pompilus honestus, Smith.

Rare ; a lovely insect, the whole of its body covered with bright golden pubescence. Procured near Rangoon in September.

Pompilus dorsalis, St. Fargeau.

Pompilus pedestris, Smith.

Common, Henzada, Bassein, Rangoon, July to November.

Pompilus unifasciatus, Smith.

Fairly common. The amount of fuscous tipping to the wings varies considerably in different individuals.

Mygnumia ceruginosa, Smith.

Very common, May to October.

Ammophila nigripes, Smith.

Ammophila vagabunda, Smith.

This genus does not seem well represented here in Burma. The above are the only two species I have managed to find.

Pelopous bilineatus, Smith.

Common; found all the year round. It very often comes into houses and builds its mud nest against the furniture, generally choosing the under side of a shelf of the dinner wagon, or the under side of the seat of a chair, and sometimes the under side of a rafter or beam. Occasionally the nest is made with cells end-on to each other; ordinarily however the cells lie parallel. One egg is deposited in each cell, the number of which latter varies from three to seven. Each cell is stuffed to overflowing with spiders, which have been paralysed by being stung, but which are by no means dead, but keep alive and fresh for consumption by the larvæ. I have remarked that *P. bilineatus* seems to invariably keep to one pretty little green species of *Epeira*.

Pelopous bengalensis, Dahlbom.

As common as the last, and constructing similar nests, but storing them with a different species of spider.

Chlorion lobatum, Fabricius.

Common. Varies in colour from a bronzy green to a dark metallic blue. I believe this species burrows into banks to construct its nest, and stores it with crickets.

Sphex argentata, Dahlbom.

Common, July to October.

Sphex ferruginea, St. Fargeau.

Rare; procured in December in the Pegu Hills.

Sphex vicina, St. Fargeau.

Sphex fluvo-vestita, Smith.

These two species are by far the commonest of the *Shagidæ*. April to November found all over the country.

Ampulex hospes, Smith.

This lovely species, first described from Borneo from collections made by Mr. A. R. Wallace, is not uncommon near Rangoon in the rains. In the Pegu Hills I got a specimen not one-third of the size of the ordinary ones, but exactly alike in colouring and in the second segment of the abdomen being suddenly produced on the under side.

Larrula subtestellata, Smith.

Common, May to October.

Tachytes sinensis, Smith.

Common, May to October.

Cerceris instabilis, Smith.

Common, May to October. I have found it solitary buzzing about flowers.

Eumenes esuriens, Fabricius.

Eumenes flavo-picta, Blanchard.

Eumenes petiolata, Fabricius.

All these are common about flowers from May to October. The last-mentioned builds nests very like that of *Pelopæus* only storing it with caterpillars instead of spiders. One nest I broke open contained the larva of some species of *Tortrix*.

Rhynchium brunneum, Fabricius.

Very common. Very frequently chooses its nest-holes in the wood-work of houses, and stores it like *Eumenes* with caterpillars.

Rhynchium metallicum, de Saussure.

Common, June to October.

Polistes hebræus, Fabricius.

Polistes stigma, Fabricius.

Both these are common, making their nests in June about the eaves of houses.

Vespa magnifica, Smith.

Karen Hills, 3,000 feet. Pegu Yoma, 1,000 feet. A huge hornet making its nests in hollow trees. The Burmans and Karens hold it in great fear. In investigating a nest too closely I was once stung by three of these insects in the face. The pain was something dreadful; my whole face and head swoll up, nausea and violent retching followed, and it was not till twenty-four hours afterwards that the inflammation began to subside. For two months after I was stung I felt the effects, in a numbed feeling on the forehead and cheek, where the stings had entered.

Stilbum splendidum, Fabricius.

A beautiful but common and widely-spread insect, found also in Europe and Africa. It lays its eggs in the cells of *Pelopæus*.

ON THE CULTIVATION OF FERNS FROM SPORES.

By M. H. STARLING.

(Read at the Society's Meeting on 2nd July, 1888.)

THE paper this evening will be a practical description of the difficulties which attend, and the best way of growing ferns from spores,

the result of my own practical experience in the matter, and I shall keep it as free as possible from scientific language. The first matter to be discussed is "What is a spore?" Spores are the little brown seed-like substance which are found in variously shaped clusters on the back of fern fronds, either covered up at some time of their existence by a thin membrane, or else always naked. Those who are not botanists would call them seeds, but they are not seeds in the sense in which we generally use the word. An ordinary flowering plant produces flowers which possess stamens and pistils either in the same or different flowers. On the stamens is a yellow cellular substance called pollen, which, when transferred to the pistil, fertilizes the seed and causes it to mature. When the seed is ripe, if it is planted in the ground, it will at once develop into a plant like that which produced it. Now ferns are not flowering plants, and spores are not seeds which have been fertilized by the action of pollen or in any similar way, and will not at once produce a plant like that from which they were gathered. What the process is I will now describe. The spore, in shape, is somewhat angular, and consists of two coats, an outer and an inner. When germination commences the inner coat is protruded as an elongate tube, which bursts, and by cell division forms the prothallium which, in appearance, resembles a small lichen of a brilliant emerald green colour. When the prothallium first appears, it is only a bright green speck, but it will sometimes grow to a size which equals a section through the middle of an ordinary sized sweet-pea seed. From the prothallium root hairs are produced, and also, on the under surface two small bodies or cells, called antheridia and archegonia. The antheridia represent the stamens in a flowering plant, and are cells in which are developed spiral filaments. The archegonia fill the place of the pistil and ovary in flowering plant; in the centre is a canal leading to the germ cell in which is a small corpuscle. When the proper time has come, the antheridia burst, and the spiral filaments penetrate the germ cell and come in contact with the small corpuscle therein, which is thus fertilized and forms the primordial cell, from which the first frond springs. Thus the growth of a fern from a spore is much more complicated than the growth of a plant from a seed. Thus much science is necessary in order to enable us to understand what is going on under our eyes, though all that can be seen by the naked eye is the growth of the prothallium and the root hairs, and the final appearance of the frond. To pass on now to

practice. The fronds, the spores of which we desire to propagate, should be gathered when the spores are just brown, but not before, as they will probably not be sufficiently matured to germinate. If left after they have turned brown, there is always a chance of the best spores having been scattered, but in this matter one has often to take his chance of what is got. The fern from which the spores are taken should be as isolated as possible, so as to eliminate the chance of the spores of other ferns having dropped on its fronds. Having picked a few pieces of a frond, or a few fronds if they are very small, they should be placed in an envelope which should be closed, and care should be taken that every portion of the edge of each flap is gummed down, otherwise if you tie up a number of these envelopes together in a bundle, and have to travel any distance with them, the spores, which detach themselves as soon the frond begins to get a little dry, will work out of one envelope and into another in the most extraordinary way. When you want to sow the spores the envelope should be cut along three sides of it with a sharp knife. On opening the envelope a large portion of spores will be found to have detached themselves; the pieces of fronds should then be shaken so as to clear them of spores, and if there are any spores still adhering to the under side of the frond, they should be rubbed off. The spores are then ready for sowing, unless the covering of the spores while on the fronds should happen to be bulky, in which case a little cautious shaking will separate the spores from the chaff, which can then be removed. This, as well as the sowing, should be done in some place protected from the wind, as the spores are very light and easily carried away by even a slight breath of air. Next as to the soil in which they should be sown. Ferns will germinate in any ordinary soil, but if you happen to take soil from the neighbourhood of growing ferns, it nearly always contains a quantity of spores of those ferns which will germinate before those you sow and will in many cases crowd them out. The great thing is to get earth which contains no spores. I have successfully used earth which has been dug from the bottom of a newly-made deep excavation: but the best course is to take an ordinary brick and burn it thoroughly in a hot fire, so as to destroy any organic substance which may be in or adherent to it, and then powder it and put the powder into a tin canister, and keep it away from the garden. When you wish to sow fern spores, take a clean pot, fill it up to about half an inch from the top with good sweet mould, sprinkle

that with a thin layer of powdered charcoal, and cover that with a little less than one-eighth of an inch of the burnt brick powder. Smooth the surface, and press it gently so as to consolidate it. On this surface the spores should be sprinkled evenly and not too thickly, covered with a glass, a plain common finger-glass is very good, and water gently poured on the outside of the glass so as to moisten the earth in the pot without disturbing the spores, and by watering in this way from time to time the earth under the glass should be kept damp. After a time the bright green prothallia will appear, and after another interval the first frond curled up at the edge of the prothallium. But patience is needed at this stage as the prothallia will sometimes be a long time in making their appearance; with other ferns the prothallia will come up very rapidly, but the fronds will be a long time in appearing. As soon as there are three fronds, the fern should be taken out of the germinating pot by means of a thin pointed stick and planted in a good ordinary mould, and kept without glass in the shade for a few days, when it will be fit to put in some place where it may get a little early morning sun. When once the plant is recognizable as a fern the progress of its growth differs very much. Some species grow very rapidly, so that in fifteen months I have grown a fern with stalks to its fronds four or five feet high, and the fronds stretching out from six to eight feet from side to side. On the other hand, I have had other species apparently refusing to grow at all for two or three years, and then getting on all right. On the table you will see some specimens of the ordinary way in which seedling ferns grow in size. You may ask, what is the good of taking all this trouble? In the first place it is very interesting to watch the whole course of fern life and to study the infantile forms of ferns. Then you can often get a piece of fern frond with spores on it from places from which it would be difficult to get a fern. It is also much easier to take on one's walks half-a-dozen envelopes and fill them with fern fronds, than to take a coolie and a basket to carry roots you may wish to dig up, or to find some fern which you covet, while walking alone, and after digging it up, having to carry it home in your hand. At the same time I believe that in the study of the rudimentary forms of ferns will be a great means of determining to what class a fern belongs. Those who have had anything to do with the names of ferns must know how tiresome it is to find the same fern known by different names. Now where

there is a dispute as to the class in which a fern should be placed, I believe in many cases the class could be determined by growing from spores the fern whose class was disputed, and ferns acknowledged to belong to each of the classes to which the fern in dispute was referred, and comparing the first or first two fronds of each. I have not had time to work this out yet, but I have noticed a strong generic likeness in the very early fronds of ferns of the same class which does not continue so strong as the plant grows up to maturity. I have also found that where a fern has for a long time been classed in some particular class, but subsequently placed by some botanists in a separate class, the early form of that fern has turned out to be quite different from the early form of those with which it has been previously classed. How far this could be worked out I cannot at present say, and I am afraid I shall never be able to work it out as I should like, because I feel I am wanting in that enthusiasm on the subject, with just a slight touch of madness, which is necessary for the successful working out of a problem like this.

Dr. D. MacDonald proposed a vote of thanks so Mr. M. H. Starling for his interesting paper, and the meeting ended.

BOOK NOTICE:

SPORT AND TRAVEL.

An interesting journal of "Sport and Travel" has been written by Mr. H. Liscomb, who appears to be a most ardent sportsman. The book describes principally the sport to be found in the district of Astor, just beyond the Cashmere frontier. The list of game-animals of Astor is not a long one, and comprises two animals for which Cashmere is famous—the markhor and ibex—and urin (or wild sheep), the brown or snow bear, and the musk deer. Describing the markhor, Mr. Liscomb says:—

My experience of the Astor animal, recorded on the sport, inclines me to think that the male, in the month of April, at any rate, wears a dirty white coat on his back, which hangs some distance down his sides, making him a very conspicuous object indeed among rocks; the light "blue grey," or "greyish brown," hardly visible on the body. These were the old males; the young bucks, herding with the females, were decidedly of a "muddy red," that made them, when they were motionless, undistinguishable from their surroundings at even a short distance. Two weeks later, in another locality, across the Indus (Dunot Valley) the old bucks had only a broad streak of dirty-white along their backs, and the light blue grey was very conspicuous.

The markhor is an ungainly animal; his long back and disproportionately short legs rather detract from his appearance as a game looking beast; his

shaggy coat and long hair which conceal the upper portions of his limbs make his ungainliness more conspicuous. Even in his gait he is not graceful, but none can deny his wonderful activity among the rocks and precipices of his favourite haunts, and he is notwithstanding these detractions, a noble animal worthy the powder and lead of the best sportsman in the world. A venerable buck, standing solitary on a rock, contemplating the world below him, will make the blood of the most blasé sportsman tingle in his veins : or a herd of long-bearded seniors, gravely crossing a patch of snow, perhaps, just beyond the reach of your rifle, is a sight that will recur to your memory for many a year after. And the amount of fatigue and labour that you will have to undergo before you can bring a forty incher to bag will certainly create a wholesome respect in you bosom for the acute sense of smell and vision, and the wide-awakeness that this animal possesses in perfection.

My experience is that the markhor is not a cold or snow-loving animal like the ibex, though nature has not been niggardly in supplying him with winter clothing. He passes his life at a much lower level, at all seasons of the year than the other animal, and he seems to bear the heat of the early summer months without any inconvenience though he still wears his winter suit. As summer advances, he is driven higher by the flocks from the villages that graze gradually up as the snow keeps melting ; and also by the swarms of flies, gnats, midges, and what not that make life a burden both to man and beast at a low level. The fresh and tender grass, too, can be found only near the snow line. These circumstances combine to keep him constantly moving upwards, till he reaches open slopes near the top of the range where he may then be seen in close proximity to the ibex. The rutting season overtakes him here by the end of September or beginning of October, and he has his short season of madness at this high elevation where cover is scarce and precipices unfrequent. Native shikaries have informed me that this is the time for markhor shooting, and that they themselves hunt him most frequently at this particular time. His shyness and seclusion, I am inclined to think, is caused a good deal by those ever present pests, the flies. The cool shades of the forest and thicket preserve him from their attacks during the heat of the day when these insects are liveliest. In the morning and evening when the cold has paralyzed the activity of the flies, the markhor is not loth to take advantage of the opportunity. The old bucks are decidedly lazy, and if a flock of them is watched for some time, a decided stiffness and slowness of movement will soon discover the seniors of the flock. The younger bucks are full of life and play, quick in their movements and have a set-to after every dozen mouthful of grass ; the elders are always feeding or resting. The native shikaries say, the old bucks keep these youngsters with them for the sake of their keener sense of sight and smell, they are quicker to detect danger and so warn their seniors.

THE IBEX.

Regarding the ibex, Mr. Liscomb writes :—

The ibex is by no one means an ungainly animal, as I have styled the markhor. He is lord of the mountain-tops, and looks every inch the monarch of all he surveys. But I must protest against the caricature of this animal at page 445 in Sterndale's book. The head shows none of the massiveness of the living animal ;

and where, oh! where is the beard, "from six to eight inches long?" As for the understandings of the figures in the book they are truly a libel on the sturdy limbs of this the gamest of mountain animals. Those spindle shanks would snap like pipstems, if they were used as I have seen the ibex use his legs while jumping from rock to rock in his mad career.

The ibex is the pleasantest animal to hunt that I know of within the limits of Kashmir. More real pleasure has been experienced in the pursuit after him than of all the rest put together. Markhor takes it out of you in a very short time; after you have secured a reasonable trophy you are apt to cry, "hold enough;" But the ibex is a gentleman in his manners and customs, as compared with his spiral horned cousin lower down on the mountain; and he gives you all the chances that a gentlemanly-minded animal should give to an honest foe. He is nevertheless "All there" when treading his ancestral hills, and after you have circumvented him, you feel that he has been a worthy opponent.

The most wide-awake animal in creation is certainly the female ibex, and she seems to exercise her vigilance solely for the benefit of the ungrateful male of her kind, who is by no means so watchful; in fact, if he is old and lazy, he keeps no look-out at all, after having comfortably laid himself up for the day. That duty falls to his compact little companion, and admirably she performs it. Uncomfortably perched on a jutting rock far above the rest of the flock, who are securely snoozing below on some soft patch of level or gently sloping ground, the sportsman's powerful telescope has watched her hour after hour lying motionless on her rocky bed, scanning untiringly, to the right and to the left and straight down before her, the mountain sides for miles and miles. The patient native of Kashmir is used to her sentry duty, and after taking in the situation, he too falls asleep like the bearded males, he is trying to circumvent, and waits patiently for a chance, but the hot-blooded Saxon, boiling over with energy and impatience, is fuming and swearing at one moment; and at the next watching the little animal through his glasses. The case is a perfectly hopeless one, there is no approach nearer than a thousand yards, without instant detection, for several hours to come at any rate; and the bad language that contaminates the pure mountain air in that locality is truly awful! How often have I resolved in these moments of desperation to shoot that one female in particular, and allow the long-horned careless one sleeping just beyond range, to go in peace just for the satisfaction of the thing. That feeling has come to more persons than myself, I am sure, when they have been similarly placed. The female ibex is the *bête noir* of the sportsman; she has spoiled many a careful stalk, and at other times has forced him to trudge many and many a weary mile to escape her all-seeing eye: when, if she had been absent, a walk of a few hundred yards would have placed him for his shot.

The report of the rifle is so similar to noises in these elevated regions that ibex are little alarmed by the crack of the weapon. "Falling rock," or "thunder" is the first idea that occurs to them when the sound reaches their ears, and their first start is to get out of the way of those familiar dangers. When a good stalk is made and the sportsman has his wits about him, several shots can almost always be obtained, and instances are not rare when three or four animals have been bagged at one stalk. The ground, too, in general is so favourable that the stalker can get within very short range, always providing that the sharp-sighted female

has been successfully dodged. I have shot bucks, at five, ten and fifteen yards distances, and a sportsman has informed me that on one occasion he could have touched the animals with the muzzle of his rifle.

CHASING THE MARKHOR.

Mr. Liscomb describes very minutely his experiences in search of markhor, and he shows that the sportsman must make up his mind to be frequently disappointed before meeting with his reward. Here is an account of a successful chase:—

18th May.—Started after these blessed buck goats, again at 6 a.m. Went up to top of ridge and then along it till we came to their tracks; and followed them down steadily for four hours. Going down the ridge was terrible work indeed. I am sure, we did not get over a mile in that time. The whole distance was one mass of crumpled rocks with great gaps between—the rocks were knife-edges, the edges to the sky, the slope below at a frightful angle, for a short distance, ending in blank precipices further down. Mirza Khan led over this dangerous ground at a good pace, always some distance ahead, going over double the ground I traversed, carefully peeping over the precipices on either side, and searching the hill sides below with the binoculars. Sharofa looked serious and did not relish the work at all, for Mirza Khan beat him at it out and out; and he had to play second fiddle throughout. I gave in after 9 a. m., and sat down on a rock, blessing the goats with all my heart. I kept my eyes on Mirza Khan all the time a good distance below, quartering the ground like the best of trained dogs. At last came his faint whistle, and it galvanized the whole of us like the shock from a battery. The real excitement of the chase now began. I went as best I could and reached Mirza Khan in no time; he said he had sighted the flock far down the precipices. He led for half a mile more and then we had the markhor under us! They were feeding at the foot of the cliff on a patch of young tender grass. It was impossible to get a shot from this point: we had to go along the ridge some distance further and take them in flank, though the range would be greater; came to a good place, a projecting rock with a stunted fir-tree growing by; it served for some cover though cover was not necessary. We were above the animals, and they were so intent on the young grass that there was no danger of detection. Got into position and picked out the largest pair of horns I could see; waited for some time, till I got a broadside shot fired and—missed. Fixed the second barrel and missed again! Took the second rifle, and at the third shot broke a foreleg. Another large markhor came into view, fired the fourth shot at him and missed! Took first rifle (re-loaded by Sharofa) and fired again at the wounded one, who was now making off, and missed again! The agony of that moment was hard to bear. The brute was limping off and would be round a projection and out of sight in ten paces more! Luckily, just at the turn, he stopped for a second to look back. My last shot and my last chance. Desperation made me steady. I put up the second sight, and with deliberate aim placed the bullet at last in the proper spot, behind the right shoulder, and the markhor rolled down the slope some distance and lay dead. The range of this shot could not have been less than 300 yards. Firing downwards at an angle of 30 degrees is very difficult

work, and many misses must occur unless the hunter is well practised in this kind of hunting. At the last shot, the animal, though further off, was nearly level with me, and hitting him was easier. Mirza Khan and Ghariba, with drawn knife, started off at a frightful pace for the "halal" (cutting the throat), but the ground was most difficult; they had to go back some distance the way we had come, then go down round one slope, cross the ravine and up the opposite hillside, on which the markhor was lying. It took them at least 15 minutes before they appeared on the opposite side, whereas the poor old buck had been goat's meat for nearly half an hour! The halal was a failure; but would not have been if Sharofa had not been so orthodoxically scrupulous. He shouted out that the animal was dead, and that no halal was possible; but to be careful about cutting well below the neck, &c., &c. Ghariba, in a rage, shouted back that he would halal. Sharofa then said the meat would be "makruh," unlawful; that was the end of the meat. I now found out from Sharofa that, in this country, the game is always considered "halal" provided the hunter, after shooting the animal, follows him up and *never sits down till he has cut his throat*, though his last act may be performed hours after the animal has been hit, or is dead. But for this convenient interpretation of the laws a good deal of meat would be wasted in a difficult country like this. In all countries, where Mussalmans are the hunters, they always have some convenient dodge like the above. Sharofa superintended the cutting off the head through the telescope. When this was done we left our perch on the rock, going back and then down hill, making for the main stream. Then up to tent at 2.30 p.m.—and so ends the hunt of the 47-inches. Dimensions—length of horn round curve, 47 inches; girth at base, 11.25 inches; divergence at tips, 26.75 inches I measured the hoof of one of the forelegs, length, 3.5 inches; breadth at heel, 2.25 inches. Of my six shoots only two took effect, the third broke the left foreleg at the knee, the sixth through the right shoulder—a splendid shot at 300 yards if not more.

IBEX SHOOTING.

I have only another week for shikar and then my return tramp must begin, so I had better make the most of the few days left. Breakfasted, and went down spur into Boin Valley. Had not gone far when a hurricane of wind and snow and sleet came on, and I had to crouch behind a rock not much larger than myself on the bare hill-side: there was no other cover in sight, a few small birch trees were scattered about. Remained in this position for an hour; and saw no hope of the storm abating; so made for camp straight down instead of going along the hill-side towards the head of the valley. We were thus obliged to abandon the exploration of a most likely portion of ibex country. Had not gone far when the storm suddenly came to an end. We regretted much having come down so soon; but a providence directs the movements of a solitary sportsman as well as the march of a nation. Sitting on the hill-side and scanning the central ridge of Boin, where I had shot the ibex, Mirza Khan saw three large bucks, not far from the spot where the first one had been bagged, but about 600 yards further down, towards the end of the spur in the direction of camp! Had the shower not driven us down so low we would certainly have missed seeing these three! Two of the ibex were grazing about, third was lying near a large flat white stone, a capital mark for guiding the

stalkers. He was a few yards above the other two, and certainly had the largest horns of all. In a direct line, they were not more than a mile from us, but to get to them we had certainly to go double the distance, down to the bottom of the valley, across the stream, and up again over some precipices that, from this side, looked utterly impossible. It did not take us long to rush down to the bottom but going up was much slower work. We had some trouble getting across the cliffs. There was luckily a goat path along the rocks that Mirza knew and followed. There were bad places in it here and there, but they were all crossed without a thought in the presence of the game above us. After this, going along the hill-side was easy enough, and I think we got into position above our quarry within an hour from our start. They had not moved from the spot where we had marked them down, and the large-horned one was still taking his ease near the white rock. By cautious creeping we got within fifteen yards of the large one in our front, and about thirty from the other two feeding below us. This was a most exciting position to be in, but it was also a most uncomfortable and trying one for me who had to use the rifle. The slope of the hill was very abrupt, and I could not get firm footing on the crumbling earth. I was standing behind a rock, partially covered by the branches of a small tree. When I stood on tip-toe, I could see the ibex lying down gazing steadily across the valley. There was a shallow water channel between us. When I stooped down I could see him indistinctly between the leaves of the tree. In neither position could I fire, and the excitement and uncertain footing were telling on my nerves! I bore this for at least two minutes, looking right into the eyes of the unconscious buck and admiring the splendid sweep of his horns. There was a far-off look in his large liquid eyes, as if he were watching for danger on the hill-side opposite, where we must have been under his view an hour ago; he certainly was not conscious of the danger within fifteen yards of him! Sometimes he would lazily shake his head and flap his ears to drive the flies off, then he certainly looked into my eyes, but the thick screen of leaves and the rock prevented discovery. The wind was, of course, in the right direction for us. There was a small round vacant space among the leaves through which, I thought, I could bring the sights to bear on the buck's shoulder as he lay, but I still had to raise myself on my toes a little, and that was not a steady position for a shot! There was, however, no other way, and I had to chance it. Motioning Sharofa to hold up my feet with his hands, I stood on tip-toe, took aim and fired. Of course I missed! The buck sprang to his feet and stood confounded for a moment and I gave him the second barrel of No. 1. I missed again! The ibex vanished round the hill and I thought seriously of suicide; but Sharofa brought me to my senses by telling me to look out for the other two. I turned round and went down a few paces but no bucks could be seen. A minute after, as we stood motionless, ready for their appearance, one of them rushed from under our position to my right about 40 yards off. He was going at a good space, but I tumbled him over like a rabbit with a bullet through his neck.—*Bombay Gazette*.

PROCEEDINGS OF THE SOCIETY.

PROCEEDINGS OF THE MEETING ON 9TH APRIL, 1888.

The usual monthly meeting of this Society took place on Monday, the 9th April 1888. Dr. D. MacDonald presiding. About 75 members were present.

The following new members were elected:—Mr. P. W. Mackinnon, Mr. Alfred Mull, Mr. Donald Bain, Mr. Thomas Summers, Lieut. H. R. F. Anderson.

Mr. H. M. Phipson announced that the following contributions to the Society's collections have been received :—

CONTRIBUTION IN MARCH.

Contribution.	Description.	Contributor.
1 Insect Cabinet.....	.....	Mr. J. Parmenides.
1 Snake (alive)	<i>Tropidonotus quincunnetatus</i>	Mr. J. Brand.
2 Leverets (alive)	<i>Lepus ruficaudatus</i>	Mrs. Wilkins.
58 Birds' Eggs	From Sikkim.....	Mr. J. C. Parker.
3 Turtles' Skulls	From Aden	Mr. G. McMullen.
19 Animals' Skulls	From Canara	Mr. F. A. Hill.
1 Malabar Squirrel (alive)..	<i>Sciurus malabaricus</i>	Do.
2 Bear's Skins.....	<i>Ursus labiatus</i>	Do.
1 Cheetal's Skin.....	<i>Axis maculatus</i>	Do.
1 Panther's Skin.....	<i>Felis pardus</i>	Do.
A Number of Queen Termites	<i>Termes dirus</i>	Dr. Day.
1 Aviary	With 19 birds,	Mr. E. M. Slater.
1 Panther's Skull	<i>Felis pardus</i>	Do.
A Collection of Moths	From Satara	Mr. B. B. Stewart, C. S.
1 Lesser Civet	<i>Viverra zibethica</i>	Mr. H. Bicknell.
1 Chinese Gold Fish (alive)	With abnormal tail	Capt. A. Moore, R. N.
A Quantity of Shells	From Trincomallee	Do.
1 Snake	<i>Ptyas mucosus</i>	Dr. D'Monte.
2 Hen's Eggs	Curiously deformed	Mr. W. Stephens.
1 Snake	<i>Lycodon anlicus</i>	Genl. Pottinger.
A number of Beetles	From Zanzibar	Rev. H. Baur.
A collection of Snakes, Lizards, Scorpions, Centipedes and Insects.....	From Trincomallee	Mr. W. Connop, R. N.
1 Stuffed Fish.....	<i>Tetrodon</i> sp	Do.
1 Four horned Antelope.	<i>Tetracerus quadricornis</i> ...	Mr. H. S. Wise.
2 Sunbirds .. .. .	.....	Mr. R. A. Straw.
3 large Gourds.....	From Muscat	Mr. S. V. Snkhtaukar.
A number of Geological Specimens	From Aurungabad	Mr. F. Rose, P. W. D.
A Painting of the Fruit of	<i>Sterculia guttata</i>	Mrs. John Jardine.

Mr. H. W. Jones exhibited two of the new 28 bore sporting guns by MacNaughten of Edinburgh, which are said to shoot as well as an ordinary 12 bore, while they weigh only 4lbs. 6oz.

Mr. F. A. Hill also exhibited two fine pair of bisons' horns, shot by him in Canara.

PROCEEDINGS OF THE MEETING ON 7TH MAY, 1888.

The usual monthly meeting took place on Monday, the 7th May, 1888, Mr. J. H. Steel, A. V. D., presiding.

The following new members were elected :—Mr. F. C. Rimington, Major J. H. Yule and Dr. James Munday.

The Honorary Secretary acknowledged the following contributions since the last Meeting :—

CONTRIBUTIONS RECEIVED DURING APRIL.

Contribution.	Description.	Contributor.
1 Spotted Owlet (alive) ...	Carine brama	Mrs. Gilbert.
1 Crocodile's Skin	Crocodylus palustris	Mrs. Pearson.
1 Snake	Dipsas gokool	Mr. M. C. Turner.
2 Birds of Paradise ...	Ptiloris alberti and Epi- machas speciosus	Dr. Hay.
7 Crocodiles' Eggs.....	From Tulsi Lake	Mr. S. Tomlinson.
A number of Marine Specimens	From a depth of 52 fathoms	Mr. G. B. Stacey.
1 Otter (mounted)	Lutra nair	Dr. W. Kay.
2 Chukor Partridges (alive).	Caccabis chukor	Dr. Anderson.
1 Fox's Skull	Vulpes bengalensis	Mr. F. Gleadow.
A quantity of Lizards, Snakes and Insects.....	From Surat.....	Do.
3 Snakes	From Poona	Mr. R. Wroughton.
1 Wallaby (alive)	Macropus sp	Mr. H. Wenden.
2 Snakes	From Aden	Capt. Wilson.
1 Hyæna Cub (alive).....	Hyæna striata	Rev. B. Winsor.
1 Crocodile (alive).....	6 feet in length	Mr. S. Louard.
2 Panther's Cubs (alive) ...	Felis pardus	Mr. H. E. Winter, C. S.
1 Python (alive)	Python reticulatus	Dr. Jas. Munday.
1 Spoonbill's Head (monnt- ed)	Platalea leucorodia	Capt. A. Gwyn.

CONTRIBUTIONS TO THE LIBRARY.

Natural History of Plants (Baillon), from Dr. Dymock.
 Study of the Mango Weevil (Simmonds), from the Author.
 Life of Erasmus Darwin (Krause), Mr. James Murray.
 Report of the Smithsonian Museum, Mr. James Murray.
 Minerals and the Use of the Blowpipe (Griffin), Mr. James Murray.
 Advanced Text Book of Geology (Page), Mr. James Murray.
 The Fodder Grasses of Northern India (Duthie), from the Author.
 Journal of the Asiatic Society of Bengal, Nos. 3 and 4.
 Proceedings of the Linnæan Society of New South Wales (Vol. II., Part IV.)

PROPOSAL TO START A ZOOLOGICAL GARDEN.

Mr. H. M. Phipson stated that a great many valuable specimens of animals had of late been offered to the Society, which owing to want of accommodation in their rooms in the Fort, they had been obliged to decline. He was of opinion that the time had now arrived when the Society should obtain, if possible, a convenient site on which to form a Zoological Garden of its own. Mr. Phipson reminded the members present that the finest collection of live animals in the world, the one in London, was originally started by, and had throughout been under the sole management of a private scientific society. There were sites in and about Bombay which would suit the purpose admirably, and if one of them could only be obtained, he felt sure the Bombay Natural History Society was strong enough to carry out the project

with success. Such a garden would, in a short time, become the chief attraction of the city, and if the entrance fee on native holidays did not exceed an anna, the advantages of such a place would be fully appreciated by the great mass of the people. The few animals, at present kept in the Victoria Gardens at Byculla, were not in a satisfactory condition, but the Municipality could not reasonably be expected to form a zoological collection at the expense of the ratepayers, and as Government had decided that no charge could be made for admission into the Victoria Gardens, after they had been so long open to the public, nothing could be done in that direction.

Mr. N. S. Symons said that he quite agreed with all the Honorary Secretary's remarks, and suggested that the Committee should carefully consider the subject and place some definite plan before the members at an early meeting.

Dr. D. MacDonald seconded the proposal, which was carried unanimously.

Dr. J. A. da Gama then read an interesting paper on the "*Origin of the Belief in the so-called Bis Cobra*," showing that the name is a corruption of *bicho-de-cobra* (i.e., the destroyer of cobras), a term applied to the mongoose by the early Portuguese settlers. Dr. J. A. da Gama quoted many ancient and quaint historians to prove this assertion, including Pierre Belon, Prospero Alpini, Engelbert Kaempfer, and Garcia de Orta. From the last writer it may be gathered that the Portuguese regarded the mongoose as a poisonous animal, and it was frequently referred to as *that poisonous reptile, bicho-de-cobra*, a creature whose venom was even greater than that of the dreaded cobra-de-capello. The Portuguese eventually adopted the term mongoose, and the word *bis cobra* gradually fell into disuse and was forgotten by them, but among the natives the idea of the *poisonous reptile bis cobra* still remained, and it has been handed down with exaggerated accounts of its tremendous poisonous properties. A full report of this paper will be found on page 154.

Mr. J. H. Steel proposed a vote of thanks to Dr. J. A. da Gama for his valuable paper in which he had traced out the origin of a term which had greatly puzzled naturalists of late.

The Honorary Secretary then quoted extracts from an exceedingly interesting paper received from Mr. L. de Nicéville, of Calcutta, on "Butterflies and Ants," which, owing to the lateness of the hour, could not be read in full. The paper appears in this number, page 164, with illustrations supplied by Mr. de Nicéville.

PROCEEDINGS OF THE MEETING HELD ON 2ND JULY, 1888.

THE usual monthly meeting of this Society took place on Monday, the 2nd July, 1888, and was largely attended. Dr. D. Macdonald presided.

The following new members were elected:—The Hon. Mr. Justice Parsons, Mr. Ameeroodin Tyabjee, Captain E. R. Shopland, Mr. W. S. Hexton, Mr. O. Myer, Mr. W. H. Trail, Mr. John Trail, Mr. W. S. Millard, Mr. W. H. W. Searle, Mr. W. L. Cameron, C.E., Mr. J. L. Jenkins, Lieutenant B. Whitehouse, R. N., Dr. I. B. Lyon, and Mr. Kaikhosro N. Kabrajee.

Mr. H. M. Phipson, the Honorary Secretary, then acknowledged the following contributions:—

CONTRIBUTIONS DURING MAY AND JUNE.

Contributions.	Description.	Contributor.
Nests and Eggs of the Edible Nest Swiftlet.	<i>Collocalia linchi</i>	Lieut. B. Whitehouse, R. N.
1 Cat's Head (mounted)...	<i>Felis chaus</i>	Mr. E. L. Chappel, C.S.
1 Snake (alive).....	<i>Lycodon aulicus</i>	Mr. W. W. Squire, C.E.
1 Jackal's Skull	<i>Canis aureus</i>	Mr. R. P. Strong.
1 Otter's Skull.....	<i>Lutra nair</i>	Do.
1 Crocodile (alive).....	<i>Crocodilus palustris</i>	Mr. A. Breul.
1 Scorpion with young.....	.....	Capt. Dixon.
4 Bats (alive).....	<i>Magaderma lyra</i>	Mr. L. H. Butcher.
Horns of the brown-antlered Deer.	<i>Rucervus eldi</i>	Dr. Henderson.
A collection of Snakes	From Burma	Do.
Trap-door Spider's Nest ..	Do.	Do.
4 live Fish in a glass bowl..	.....	Mr. Cawasjee D. Furdunjee.
65 specimens of Rock	Found while excavating the Victoria Dock, Bombay.	Mr. J. Fleming, C.I.E.
4 Eggs	<i>Pratincola cuprata</i>	Lieut. H. E. Barnes.
1 Porcupine's Skull	<i>Hystrix leucura</i>	Mr. E. L. Cappel, C.S.
1 Indian Monitor	5 feet in length	Mr. M. C. Turner.
A Quantity of Corals .....	.....	Do.
16 Crocodiles' Eggs	<i>Crocodilus palustris</i>	Mr. S. Tomlinson.
Coral and Shells.....	From the Red Sea	Mrs. Briscoe.
Net of the Common Honey-Sucker.	<i>Cinnyris zeylonica</i>	Mr. H. F. Hatch.
1 Snake	<i>Passerita mycterizans</i> ..	Mr. H. W. Barrow.
1 Gecko	With two tails.....	Mr. S. Cooke.
1 Pied Crested Cuckoo (alive).	<i>Coccyzus melanoleucos</i> ...	Mr. W. J. Essai.
1 Crow.....	Struck by lightning	Mr. W. Shipp.
A Quantity of Stalactites and Stalagmites.	From Poona.....	Do.
1 Snake	<i>Trimeresurus strigatus</i> ..	Mr. E. M. Slater.
1 Large Honeycomb.....	From Baroda	Mr. Visibhoocan Atmaram.
Head of Nilgiri Wild Goat...	<i>Capra hylacrius</i>	Mr. E. M. Slater.
Corals	From Persian Gulf	Capt. W. Morrison, R. N.
1 Tortoise (alive)	<i>Testudo elegans</i>	Mr. Krishnarno B. Navalkar.
1 Lynx (alive)	<i>Felis caracul</i>	Capt. F. D. Alexander.
1 Panther Cub (alive)	<i>Felis pardus</i>	Lieut. A. F. Pinhey.
1 Hyæna Skin	<i>Hyæna striata</i>	Mr. E. Von Hantelmann.
1 Indian Monitor (alive)...	<i>Varanus dracæna</i>	Capt. R. C. Dixon.
2 Lizards	<i>Calotes rouxii</i>	Rev. F. Dreckmann, S. J.
2 Rats.....	(?) Sp.	Do.
Eggs of	Crested Black Bunting ..	Mr. J. Parker.
Do.	White-cheeked Crested Bulbul.	Do.
Do.	Crimson-winged Laughing Thrush.	Do.
1 Rose Ringed Paraquet ...	.....	Sergt.-Major Webb.
1 Aviary .....	.....	Dr. Langley.
Edible Birds' Nests	<i>Collocalia unicolor</i>	Mr. C. R. Brendon.
1 Cobra (alive)	<i>Naga tripudians</i>	Mr. G. Carstensen.
1 Black-headed Cuckoo Shrike.	<i>Vulocivorn Syksii</i>	Capt. Becher, R. A.
Fore-arm of Lion	From Gujerat	Mr. Ameeroodin Tyabji.
1 Paradise Flycatcher	<i>Muscipeta paradisi</i>	Dr. da Gama.
1 Lizard	<i>Chiamela lineata</i>	Mr. J. E. Wilberbore.
1 Pair Sambur Horns	Abnormal.....	Mr. W. Lee Kirby.
1 Nilgiri Goat's Head	<i>Copra hylacrius</i>	Dr. A. C. Gaye.
1 Indian Monitor (alive) ...	<i>Varanus dracæna</i>	Mr. W. Holland.
A Quantity of Larvæ	<i>Psyllidæ</i> sp.	Mrs. Ricketts.
1 Flying Lizard.....	<i>Draco dussumieri</i> ..	Mr. T. R. D. Bell.
1 Snake	<i>Cynopi malabaricus</i>	Do.
5 Bird-eating Spiders	<i>Mygale</i> sp.	Mrs. H. S. Wise.
3 Snakes	From Canara	Do.

CONTRIBUTIONS TO THE LIBRARY, MAY AND JUNE.

Title of Book.	Presented by
Journal of Comparative Medicine and Surgery, Vol. IX., No. 2.	By exchange.
Proceedings of the Zoological Society, 1886, Part 4; 1887, Part 1.	Mr. Jas. Murray.
Large Game Shooting in Thibet, Himalayas, and N. India (Kinloch).	Mr. C. B. Lynch.
Nature. Vols. I., II., and III.....	Rev. A. G. Kane.
British Association Report, 1881	Do.
Fertilization of Orchids (Darwin).....	Do.
The Aquarian Naturalist (Rymer Jones).....	Mr. G. Ormiston, C. E.
Bulletin of the California Academy of Science, No. 7	By exchange.
Evolution without Natural Selection (Dixon).....	Capt. Becher, B. A.
Wheat and Rice Weevils in India (Cotes)	From the author.
Introduction of Insecticides into India (Cotes)	Do.
List of the Butterflies of Khorda in Orissa	Mr. W. C. Taylor.

AN APPEAL FOR HELP.

The Honorary Secretary stated that he had heard recently from Mr. Robert Wroughton, of Poona, with respect to the collection of Hymenopterous insects (ants, bees, wasps, &c.), which that gentleman had for some years past been making for the Society. The collection now consisted of 489 species, but as the majority of these had been caught in the neighbourhood of Poona, the supply was nearly exhausted in that part of the country. The assistance of every member of the Society was earnestly solicited in order that this very valuable collection might be increased. Mr. Wroughton was now trying to work out the "life history" of the different species and was consequently in want of the nests of all sorts of the hymenoptera. The females of some wasps were unknown, and as many of the hymenoptera were supposed to be parasitic on one another, discoveries could only be made by breeding and rearing. "Mud-balls" of all sorts, so common on the walls of bath-rooms and verandahs, bits of rotten sticks hollowed out and closed up, "brown paper" nests, &c., should all be carefully collected, and sent to Mr. R. Wroughton, Forest Officer, Poona. The best way of transmitting specimens is to send them packed in dry sawdust, but each nest should be sent in a separate box.

EXHIBITS.

Mr. E. L. Barton exhibited 3 tigers' heads and one bear's head recently mounted by him for members of the Society, all of which were greatly admired.

Mr. John Wallace, C. E., also exhibited a new description of Camp-bed which he has recently invented. It appeared to possess the two essentials, *strength* and *lightness*, and when doubled up in a canvas bag with mosquito curtains, poles, &c., complete, weighed only 16 lbs.

THE PROPOSED ZOOLOGICAL GARDENS.

The following letters, written by the Honorary Secretary to the Collector of Bombay and to the Municipal Commissioner, were laid before the meeting:—

6, Apollo Street, Bombay, 15th June, 1888.

From the HONORARY SECRETARY, Bombay Natural History Society ; to the COLLECTOR OF BOMBAY, Bombay.

SIR,—(1) I have been requested by the Committee of the Bombay Natural History Society to ask you whether the Government of Bombay would be disposed to assist the Society in forming a zoological collection and aquarium, by placing at its disposal a piece of land, free of rent and taxes, for that special purpose.

(2) The principal reasons, which have induced the Committee to make the above request, are the following :—

I. The number of valuable and interesting specimens which are constantly being offered to the Society by its members from all parts of the country, but which owing to want of accommodation, the Committee are unable to accept.

II. The great interest which the inhabitants of this country take in such collections, and the importance of imparting a more accurate knowledge regarding the fauna of India and adjacent countries regarding which the ignorance of the people is so great.

III. The desire on the part of the Committee of this Society to facilitate and promote scientific investigation regarding the habits of tropical animals, birds, and fishes, kept under favourable conditions for observation.

IV. The importance of increasing and improving the supply of fish (both fresh and salt water) and other important articles of food.

V. The necessity of encouraging the acclimatization and domestication of various birds and animals, and the importance of improving the indigenous breeds of cattle and farm-stock in this country.

(3) The few specimens of animals at present kept at the Victoria Gardens, Byculla, are not in a satisfactory condition, but in the opinion of the Committee the Municipality cannot be expected to incur any considerable expenditure in maintaining a zoological collection at the cost of ratepayers.

(4) The Bombay Natural History Society, although it was started only in 1883, is a flourishing and growing institution, with 420 members, and the Committee are confident that if Government will grant them a suitable site, they will be able, in a few years' time, to form a zoological collection which, besides being a credit to the City, will become an important educational factor amongst the more intelligent part of the native community.

(5) The Committee count on the support of the Municipality of Bombay in carrying out its project, and would be prepared, in return, to enter into an agreement for the benefit of the poorer ratepayers, never to charge more than one anna entrance fee for adults, and half-an-anna for children on all recognised public native holidays.

(6) The site which, in the opinion of the Committee, is the best suited for the purpose of a zoological garden and aquarium is the Chowpatty cliff, extending from the footpath leading up the hill, on the right (formed by the main water-pipe) to the Siri Road on the left, including the vacant land at the foot of the hill. This land appears to be of little value for building purposes, but owing to its being protected from the strong sea winds, and being at the same time close to Back Bay, it possesses particular advantages for a zoological collection and for the erection of fresh an salt-water aquaria, which the Committee consider to be of so much importance.

(7) The Society would also be glad if Government would allow them to rent the two bungalows which stand on the piece of land in question facing the old Chowpatty Road.

(8) I enclose a rough sketch of the ground which the Society desire (marked with blue lines on the plan), and attach a list of the present Office-bearers and Managing Committee.—I have, &c.,

H. M. PHIPSON,
Honorary Secretary.

H. E. Lord Reay, G.C.I.E., LL.D., President, Managing Committee: Hon. Mr. Justice Birdwood (Vice-President), Dr. D. MacDonald (Vice-President), Dr. G. A. Maconachie (Vice-President), Colonel C. Swinhoe, Rev. Fr. Dreckmann, S. J., Dr. T. S. Weir, Dr. Kirtikar, Mr. J. H. Steel, A.V.D., Mr. G. W. Vidal, C.S., Mr. W. F. Sinclair, C.S., Dr. Edith Peckey, Major W. S. Bisset, R.E., Lieut. H. E. Barnes, Mr. J. C. Anderson, Mr. E. L. Barton, Mr. A. Leslie, Honorary Treasurer; Mr. H. M. Phipson, Honorary Secretary.

6, Apollo Street, Bombay, 15th June.

From the HONORARY SECRETARY, Bombay Natural History Society: to the MUNICIPAL COMMISSIONER, Bombay.

Sir,—I have been requested by the Committee of the Bombay Natural History Society to send you the enclosed copy of a letter dated to-day, which I have addressed to the Collector of Bombay on the subject of a site for a proposed Zoological Garden in Bombay. The Committee are about to lay before the members of the Bombay Natural History Society some definite proposals, but before doing so they would like to know to what extent the Municipality would be disposed to co-operate with them in carrying out so desirable a project.

I am instructed to say that if the Municipality would agree to hand over to this Society (in the event of their obtaining the site) the specimens now kept in the Victoria Gardens, with the cages, building materials, &c., and to make an annual contribution of a sum equal to the amount now spent in maintaining the animals, the Committee of the Society would, in return, propose that for the benefit of the poorer ratepayers, the Society should bind itself never to charge more than 1 anna for adults, and $\frac{1}{2}$ anna for children, as an entrance fee into its garden on *all recognised native public holidays*.

You will observe that the site which the Committee hope to obtain, and which they consider to be most suitable for Zoological Gardens and Aquaria, is the piece of vacant land at Chowpatty and the ground which extends up the side of the hill to the edge of the cliff. The narrow piece of ornamental land between the road and the edge of the cliff would not be required, and the Society would engage not to obscure the view in any way from the road.—I have, &c.,

H. M. PHIPSON,
Honorary Secretary.



Antelope Creek, Ark. Forest.

BULL MULEDEER KILLED BY TIGER, NOV. 1911

(This is a photograph taken by W. D. Hoar.)



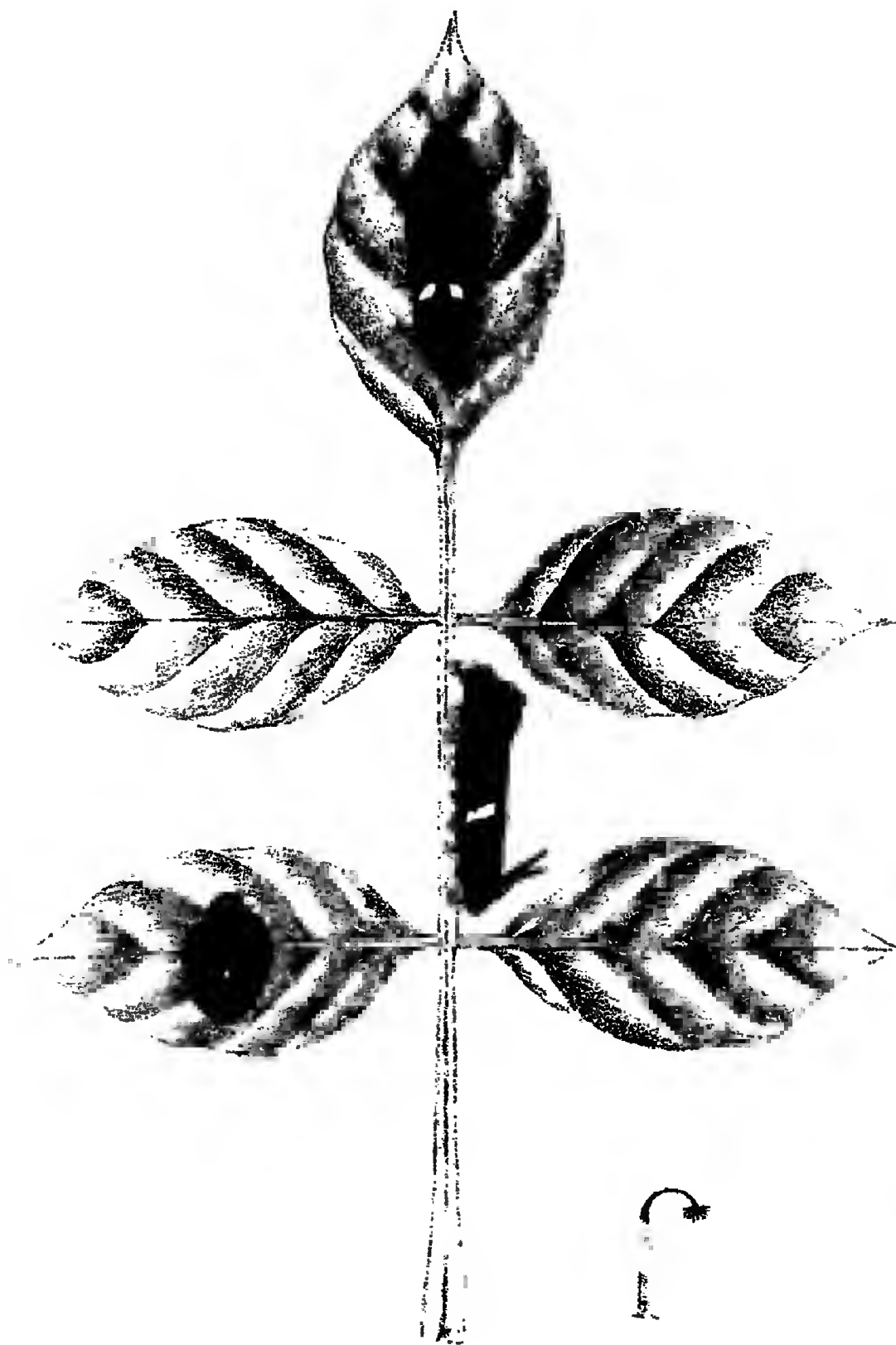
Winton Beech Ltd. London

NIELGAI AFTER 2ND MEAL BY TIGRESS & TWO CUBS.

(from a photograph taken by Mr. J. D. Inverarity)



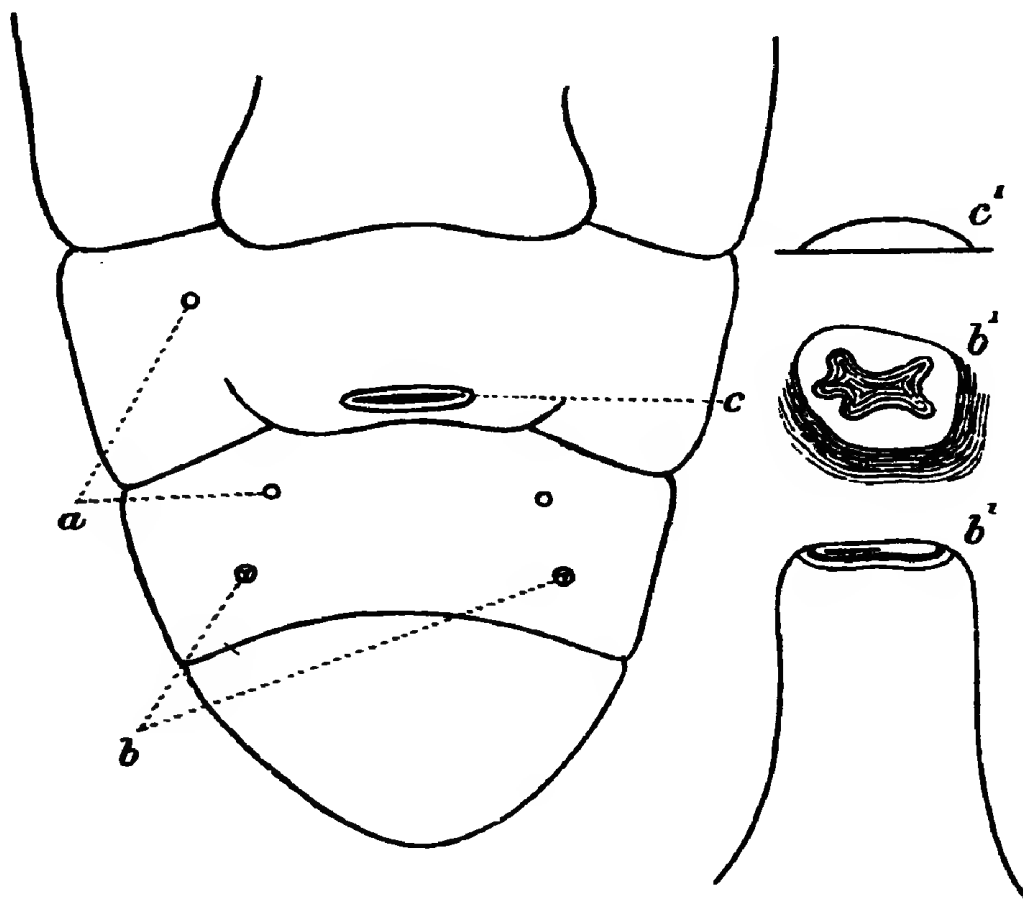
HIND LEG OF RUFFIAN NIFTGAI HAMSTRUNG BY A TIGER
(from a photograph taken by M. l. l. Inverarity.)



LARVÆ AND PUPA OF CURETIS THETYS, DRURY, ENLARGED.
(Also Enlarged view of the Tentaculum, with brush extended, on the 12th Segment of the larva.)

THE LAST SEGMENTS OF LARVA OF LYCÆNA PSEUDARGIOLUS, ENLARGED.

SHOWING THE ORGANS AFFECTED BY THE ANTS.



- a*—stigmata or breathing holes, on 11th and 12th segments;
- b*—spots resembling stigmata on 12th segment ;
- b¹*—processes issuing therefrom, front and top views ;
- c*—opening on 11th segment ;
- c¹*—ovoid membrane.

The processes *b¹* are but partly protruded and do not show the tuft of hairs with which they are furnished at the apex.